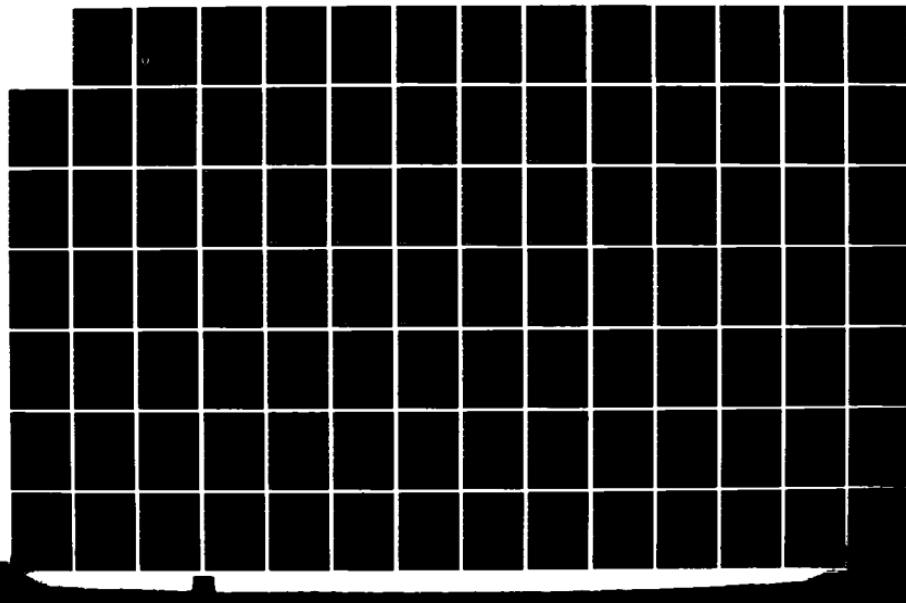


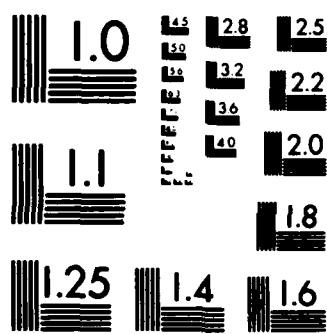
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BULOVA SYSTEMS AND INSTRUMENTS CORP ALLEY STREAM N Y  
M MOSKOWITZ MAY 84 330-044 ARLCD-CR-83047

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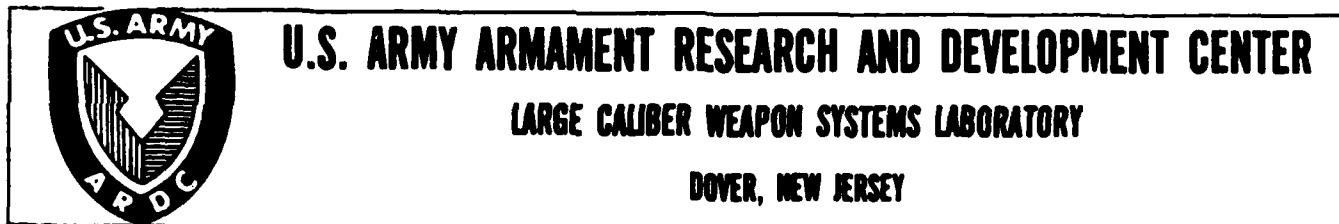
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CONTRACTOR REPORT ARLCD-CR-83047

MAGNETIC POWER SUPPLY ASSEMBLY OF M509A2E1 FUZE

M. MOSKOWITZ  
BULOVA SYSTEMS & INSTRUMENTS CORP  
VALLEY STREAM, NEW YORK

May 1984



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19 KEY WORDS (Continue on reverse side if necessary and identify by block number) Encapsulation Magnetic power supply      MMT-process improvement      Fuze VIPER fuze      Setback generator      Sonic welding Centrifugal timing      Wave flow soldering      Printed circuit board Test console      Electrical test console      M509A2E1 fuze Release mechanism      Lead-forming system      Computer controlled		
20 ABSTRACT (Continue on reverse side if necessary and identify by block number) The objective of this study was to develop the technology of manufacturing the M509A2E1 fuze used in the 105-mm heat round. In Phase I the detailed design of the assembly stations was completed and a functional layout of the line was established. In phase II the fabrication and procurement of the hardware necessary to set up the critical stations were investigated. It provided for installation and debugging of the equipment which displayed increased reliability and producibility of the setback generator, magnetic power supply assembly, and printed wiring board assembly.		

## SUMMARY

The efforts of Bulova Systems and Instruments Corporation (BSIC) involved in launching and successfully completing the manufacturing, methods, and technology (MM&T) program relating to the facilitization of the magnetic power supply assembly (MPSA) of the M509A2E1 PIBD Fuze are described in this report. The report reviews the tasks undertaken, problems encountered, and solutions which were developed. It shows that the assembly tooling, inspection, and test equipment met or surpassed, in almost every instance, the production rate of 63 units per hour (500 units per day in an 8-hour shift). The maintainability, reliability, and safety requirements were equally satisfied.

## FOREWORD

Certain Bulova Systems and Instruments Corporation documents that are included in the Appendix were previously submitted to, and accepted by, ARRADCOM. To avoid possible confusion, those approved documents herein reproduced have not been revised in content or format. Only signatures have been deleted. Therefore, when referring to the test demonstration, any reference in these documents to "Phase A" or "Phase B" shall be understood to mean "Part A" and "Part B" respectively.

Certain documents in the Appendix are noted as a sample. The balance of the material is included in the Continuation volume of this report and is available on request.



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## INTRODUCTION

The program was divided into two phases. Each phase took approximately 18 months to complete. Phase I included the assembly tooling, inspection, and test equipment for high volume production and improved producibility of the setback generator (10,000 per month) and the magnetic power supply assembly (MPSA) (printed wiring board assembly). It also included inspection and test of the MPSA and its encapsulation in the rotor housing.

Phase II of the program was concerned with:

1. Upgrading the setback generator to a plug-in type
2. Converting the MPSA to a thicker printed wiring board (PWB) and multiple array panel assembly
3. Upgrading the MPSA acceptance test console
4. Procuring a four-nest centrifuge and arming time test console
5. Upgrading of existing tooling, inspection, and test equipment
6. Completing all other remaining contractual requirements

## SETBACK GENERATOR AND RELATED EQUIPMENT

### Generator Design

The fundamental functioning of the fuze required that the setback generator (SG) provide electrical energy to a capacitor which would store it and, under proper conditions, reliably function the detonator. It was established that an output of 100 volts minimum into a 0.56 ufd capacitor load would fulfill all requirements. Several different designs were evaluated. The ARRADCOM configuration, with the addition of a shear disc, was selected for development. It was designated as the Mark I generator.

Assembly of prototype units revealed much difficulty in properly securing and bringing out lead wires through the terminals. Another problem area was in maintaining a satisfactory seal around the terminals to prevent the infiltration of potting into the SG. A matter of serious concern was that the jamming of the multipiece magnetic train could, and in certain units did, occur during setback.

Several designs were evaluated in the development phase. They included: a longer stroke, a different magnetic train, and an alternate coil winding. As predicted, higher voltages were obtained

using a longer stroke and also a single magnet. The one-piece magnet proved to be more reliable.

The SG was then completely redesigned to eliminate the aforementioned problems and to develop a component that was more easily produced and more reliable. This design was designated the Mark II generator. It included replacement of the existing magnet and two-core piece assembly with a longer single magnet of the same diameter. Tests indicated two benefits:

1. A generator output voltage higher than previously available was obtained.
2. A possible hang-up of the magnet/two core pieces on the inside of the generator coil assembly was overcome.

This new model required the design and fabrication of new manufacturing tooling such as a set of progressive dies for the armature body, a new bobbin mold, and a new mold for the plastic bottom cover. Because of the long lead time for the new tooling and parts, Mark II generators were not readily available for evaluation by ARRADCOM. A parallel testing program was pursued until May 1982 when ARRADCOM directed the sole use of the Mark II SG in the M509A2E1 base detonating element.

Regarding the Mark II SG, testing indicated that the bobbin flanges had to be made thicker and the bosses seating the terminal posts be stronger. It also was necessary to change the coil wire size from 41 AWG to 38 AWG, to reduce the form factor of the coil winding, and also reduce the number of turns to lower the output voltage. Outputs in excess of 200 volts had been obtained causing concern that the 0.56 ufd capacitor would be overstressed.

As a result of laboratory testing it became evident that delrin would not provide a reliable seal against potting infiltration. When soldering the SG to the printed wiring board (PWB), the heat from the soldering iron tip on the terminal post produced local distortion of the plastic bottom cover and occasional loss of seal integrity.

To replace the delrin, an ultra high temperature plastic was found: Ultem 1000, an unfilled polyetherimide resin that had recently been marketed by General Electric Company. It was chosen over teflon for two reasons. It was a thermoplastic and could be formed in the existing mold. Secondly, its heat deflection temperature of 200° C was considered satisfactory for this application.

Further investigations were carried out to define several test parameters. It became evident that the use of a helium leak detector was unduly conservative and expensive. A vacuum leak test with air

proved sufficient to assure proper seal integrity. A lower value of magnetic leakage flux was also established. Recognizing that there were technical limitations in using leakage flux as a measure of magnetic charge, a minimum value of 95 gauss was selected.

The final improvement to the SG was accomplished by conversion to a plug-in generator (PIG). Longer terminal posts were provided to engage with mating receptacles on the PWB. It eliminated soldering of the posts to the PWB circuitry simplifying assembly of the MPSA.

#### Related Equipment

Analysis and evaluation showed that certain assembly processes used in the development program were not fully suitable for high volume production. The following examples show advances that have been made.

The original design for the setback generator, although functionally adequate, had some production shortcomings. An average time of 23 minutes was needed to wind the coil assembly. It took 17 of those 23 minutes to attach external leads to the coil's leads via a soldering process. In order to overcome this problem, and strengthen the bobbin, the coil assembly was redesigned. External leads were replaced by resistance welding the coil leads to pins installed in the bobbin. The resistance welding process also eliminated the need to clean up the flux residue left by the hand soldering process and further reduced the time to establish and test the coil connections to under one minute total.

BSIC recommends that, when additional funding becomes available, studies be made to eliminate the existing method of chemical stripping of the bobbin coil leads prior to welding. Among the possible alternatives are:

1. A new method of mechanically stripping the polyurethane insulation.
2. Replacing the present resistance welding with a different process such as ultrasonic welding or laser welding. (Note that laser welding might involve the use of another wire insulation.)

A Bulova owned coil winding machine was modified to accept the bobbin and to wind two coils at a time, rather than one at a time. The modified machine was thus able to produce bobbin assemblies at twice the rate compared to the older, less sophisticated winder.

A new type magnetic charger and special gaussmeter were purchased and modified by Bulova. Utilizing these in conjunction with additional special fixtures, as many as 30 setback generator assemblies could be magnetized and validated in a single charging cycle.

The various assembly stations (numbers one through eight) are described in the Demonstration Test Report, Part A.<sup>1</sup> Additional details may be found by consulting that document.

#### MAGNETIC POWER SUPPLY ASSEMBLY (MPSA)

The printed wiring board (PWB) assembly known as the MPSA was basically a difficult task in packaging and in component selection. The functional components included in this section are described in Table 1 below.

Table 1. Component function

<u>Component designation</u>	<u>Function</u>
Resistor, R1	It provides a charging path for the stray capacitance in the wiring and in both normally open switches (the crush switch, S1, and the impact switch, S4). This would prevent functioning of the detonator, F1, at the 90° contact position causing an unnecessary dud.
Resistor, R2	To slowly bleed any accumulated charge from capacitor C1, maintaining safety during storage and handling.
Impact switch, S4	When closed on graze impact, it provides a discharge path allowing the capacitor to fire the detonator, F1.
Diode, D1	To prevent discharge of capacitor, C1, through the SG.
Capacitor, C1	To store the energy produced by the SG.

The PWB of the MPSA was originally designed as a round single-sided circuitry board 1.187 in. O.D. X 0.03 in. thick. With the passage of time and many tests of the base detonating element (BDE), component locations were changed as well as horizontal/vertical installation on the PWB.

In the fall of 1982, the PWB of the MPSA was redesigned to provide a two-sided board with plated through holes, the same O.D., the thickness increased by 50% to 0.048 in., and with revised

---

<sup>1</sup> Included in this report as Appendix D.

component locations. This new design of the individual PWB was further improved for high volume production by ordering them in a panel configuration (approximately 5.8 in. long X 2.8 in. wide) array of two rows of four each. The individual PWB would also be screened (component configuration) and pre-punched with a die.<sup>2</sup>

The PWB assemblies supplied in the panel configuration described above were mounted in holding fixtures. All components and parts required were installed (after "preforming") on a group basis taking advantage of a learning curve as compared to assembling one MPSA completely at a time. All masking, dressing, and the like was accomplished on eight boards at a time.

In the fall of 1980, a component lead forming system was purchased from Heller Industries. This system consisted of one Heller axial component lead former, model H-116, with different feed options, and two custom die sets. Also procured was one radial lead component former, model RD-70C, and one custom die set. The custom dies for both machines were predicated on the existing MPSA configuration at that time.<sup>3</sup> The axial component lead forming machine setup accepts components supplied in a tape and reel configuration. It can produce up to 18,000 formed components per hour under optimum conditions. The radial component forming machine can produce up to 1,500 formed components per hour under optimum conditions.

These component lead forming machines are used to preform all the axial and radial lead components required for the MPSA. This permits full utilization of the high volume assembly technique of "group stuffing" with the PWB supplied in the "8-up" panel array.

In May, 1983, BSIC purchased from Hollis Engineering a wave soldering system model TDL with an adjustable 10-inch-wide finger conveyor and other options and accessories. Also procured was a Hollis ultra-clean vapor degreaser with certain options and accessories for cleaning the wave soldered MPSA. The hourly production rate of the wave soldering system under optimum conditions with the current panel configuration of two rows of four PWB's is approximately 425 panels (3400 PWB's) per hour. It will yield up to about 20,000 MPSA's in any 8-hour shift. The panels could easily be increased in size by a factor of eight. Then eight times as many MPSA's per hour could be processed with this system. In the case of the ultra-clean vapor degreaser for cleaning the wave soldered PWB,

---

<sup>2</sup> The vendor refers to this pre-punching process as "return to web".

<sup>3</sup> This was a PWB with a 1.187 in. O.D., 0.03 in. thickness, single-sided circuitry. The component leads were clinched over and hand soldered.

the hourly production rate under optimum conditions is up to approximately 1,000 MPSA's per hour. A new "in-line" type cleaner with greater capacity would be required should the need arise to have more than 8,000 MPSA's cleaned in a given 8-hour shift.

#### SPECIAL SEMI-AUTOMATIC COMPUTER-CONTROLLED TEST EQUIPMENT

##### Magnetic Power Supply Assembly Acceptance Test Console

During Phase I of the MM&T program, a semi-automatic acceptance test console was developed. It tested the assembled MPSA as installed in a rotor housing assembly before and after encapsulation. A total of 10 different tests were sequenced and their data displayed on a digital voltmeter. The data was then evaluated by comparison with a table of values reflecting the required accept/reject limits. Results were then manually recorded on a data sheet. This acceptance test console thus required an operator of technician caliber rather than inspector caliber. The hourly production rate for this version of the acceptance test console under optimum conditions was 15 assemblies per hour.

In Phase II of the program, this MPSA acceptance test console was upgraded by using a computerized control center with a printout for each of the 10 tests. This printout includes upper and lower limits, the test measurement, an evaluation of the data, and an accept or reject decision for each unit tested. Furthermore, a new dual nest with additional associated electronics was added to obtain more efficient utilization of the tester. While one unit is under test and the printer processing the data, the previously tested unit can be removed and replaced with a new unit to be tested. The current hourly production rate with a paper tape printout is 42 units per hour.<sup>4</sup>

##### Centrifuge Arming Time Acceptance Test Console

A new centrifuge arming time tester was made for Phase II of the MM&T program. It incorporated many improvements over other existing equipment. The GFE centrifuge was fitted with four nests to support the sequential testing of four M509A2E1 PIBD fuzes. The centrifuge was wired with the necessary electronics to interface with the new acceptance test console. The new acceptance test console is computer controlled with computer evaluation of the data on a printout (same model computer as in the MPSA acceptance test console).

The new arming time test console contains a storage oscilloscope with provisions for playback of data from previously tested or current units. Its design also permits manual or automatic sequence

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<sup>4</sup> Test cycle time: 1 minute; printout time: 29 seconds; load and unload time for each nest of fixture: 6 to 10 seconds.

testing of units. The arming time test system can easily be adapted for many different fuze types and variations by reprogramming the computer and providing new test probe interfacing. The hourly production rate of this acceptance test console operated under optimum conditions is 40 units per hour.

#### ENCAPSULATION OF THE MAGNETIC POWER SUPPLY ASSEMBLY

Encapsulation method and materials used the MM&T Part B demonstration was the result of many investigations and studies conducted during the M509A2E1 product improvement program (PIP) and the MM&T program. Among the parameters evaluated were:

1. Encapsulation materials
2. Curing temperatures
3. Loading pressures
4. Delivery techniques
5. Size and location of filler holes, vent holes, and tubing

A more definitive treatment of this evaluation is included in the Final Technical Report<sup>5</sup> of the Product Improvement Program for the M509A2E1 PIBD Fuze.

The method selected to be used for demonstration fulfilled the technical and functional requirements of protecting the MPSA during setback. The process required conformally coating the diode, D1, and capacitor, C1, prior to installing the MPSA in the rotor housing. The material used was a Dow Corning silicone resin 1-2577 with 176 catalyst conforming to MIL-I-46058. It also required several prepotting steps: sealing the 90° contact assembly to the rotor housing; sealing the port of the rotor housing and the S2 switch housing at their juncture; and sealing the hollow plastic screw to the rotor housing at their juncture.

These steps must be completed at least 18 hours prior to final potting. The potting material used was Hysol RE 2039 resin and HD 3561 catalyst. It was allowed to air cure for 24 hours before handling. Although the current method provided good units, the production rate was considered too low.

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<sup>5</sup> This document, BSIC number 316-171 was previously submitted to ARRADCOM, Dover as CDRL Item A029 under Contract DAAK10-79-C-0331. See BSIC letter CA-AGS-2400, Att:DRDAR-LCN-T, dated 27 June, 1983.

## DELIVERED AND DELIVERABLE HARDWARE

As part of the Part B demonstration, 50 base detonating elements were manufactured in an air gun configuration. These units had the following features:

1. Inert heat indicator
2. Gold plated contacts on the heat indicator assy
3. Disabled drag (flush drag weight pin)
4. 0.047 in. thick PWB
5. Condition "B" leaf pins
6. Rotor shaft tang removed
7. Bleed resistor, R2, omitted (680 megohms)
8. Trembler switch, S4, omitted

For details relating to other deliverable parts and assemblies fabricated and tested in stations 9 through 23, refer to the Demonstration Test Report, Part B.<sup>6</sup>

## CONCLUSION

### Setback Generator

Future studies should be made to replace or eliminate the existing method of chemically stripping the wire leads of the bobbin coil assembly (setback generator) prior to welding. Possible alternatives are:

1. A new non-destructive method of mechanically stripping the polyurethane insulation.
2. Ultrasonic welding or laser welding as a suitable replacement for the present resistance welding process. (Note that this alternate process might involve the substitution of a different type of wire insulation).

### Solderability

A review of the PWB of the MPSA for improved solderability using the wave soldering process and the state of the art assembly techniques suggests the following:

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<sup>6</sup> Included in this report in Appendix J.

1. Reduce the plated through hole diameters to improve capillary action.
2. Increase the thickness of the PWB to 0.062 in.
3. Improve the component layout so that diode, D1, can be mounted horizontally and flush against the PWB.
4. Reduce the mounting hole diameter for the four pin jacks to obtain a press fit condition. This will ensure they remain in place during soldering.

A review of the switch assembly, S2, suggests the following to alleviate certain assembly problems which became evident when using the wave soldering process at assembly:

1. Terminal Switch. This is the tinned brass termination on the end of the movable S2 contact installed in the PWB. Even though the equivalent of the type currently used for the XM763 fuze was employed for the MM&T demonstration MPSA, it is too massive and should be reduced—in geometry and dimension. Installation in the MPSA should be a light press fit rather than by staking.
2. Contact Wire. This is the "L" shaped gold plated brass contact. It should be reduced in cross-section to about half its present size of improve solderability.
3. Switch Housing, S2. This exhibited a tendency to lift-off from the PWB surface (component side).

It was noted that during wave soldering, a temperature of approximately 500°F was experienced. An investigation should be pursued to determine if a design change (geometric - dimension) or new material would provide the solution. Modification of the existing mold or a new mold may be required.

#### Encapsulation

The current encapsulation process consists of two parts:

1. Prepotting; rate: 5 units per hour
  - Juncture of S2 switch housing and rotor housing
  - Juncture of hollow plastic screw and rotor housing
  - Juncture of 90° contact and rotor housing
  - Three hours cure at 60°C
2. Final encapsulation of MPSA; rate: 20 units per hour

In order to improve the hourly production rate for the prepotting operations, it is recommended the S2 switch housing, the hollow plastic screw, the 90° contact assembly, and the rotor housing be redesigned. It is also recommended that replication of this station be accomplished.

In order to improve the hourly production rate for the final encapsulation, an automatic mixing and dispensing machine should be procured. It should be designed with sufficient daughter stations to meet the required rate.

#### Testing

The hourly test rate of approximately 40 MPSA's at the dual nest MPSA semi-automatic acceptance test console could be improved. Currently averaging about 1.5 minutes per unit, it could be easily reduced to 1.0 minute per unit by changing the computer print out. The details of each of the 10 tests could be eliminated and replaced by a simple accept/reject. Considering recent advances in computer and electronic technology, it is also possible to design and fabricate an additional test console to insure a minimum hourly test rate of 63 units (molded housing assembly level).

The hourly test rate of approximately 40 housing and mechanism assemblies on the centrifuge arming time acceptance test console could be improved as follows:

1. Reduce the data sampled per unit from 4,000 to 2,000 points.
2. Add an additional data line and slip ring to handle sampling (and evaluation) of two units simultaneously.
3. Modify the computer program as required.

It would then be possible to upgrade the hourly test rate to almost double its present level. But until an arming time acceptance test console attains a level of approximately 65 units per hour, a replication of the current type would insure the goal of 500 units per 8-hour-shift day.

#### Summary

An analysis of the data from the MM&T demonstration Parts A and B indicates the following:

1. Eliminate, or replace with an alternate method, the current insulation stripping method for the Mark II SG coil assembly (prior to welding). It will provide an assembly line production rate which will equal or exceed in all operations the program goal of 10,000 per month (500 per day) with one 8-hour shift.

2. The hourly production rates of the assembly tooling and inspection/test equipment demonstrated in Part B was satisfactory for the program goal of 10,000 units per month (500 per day) with one 8-hour shift except for the operations and equipment listed below. These will require appropriate replication to meet the hourly rate of 63 per hour.

Installation of the S2 contact on the PWB

Installation of electronic components on the PWB

Preliminary and final encapsulation of the MPSA

MPSA acceptance test console station

Centrifuge arming time acceptance test console

#### EXPANSION RECOMMENDATIONS

Under the provisions of the contract, this project provided the tools, equipment, and techniques needed to manufacture the M509A2E1 fuze. Presently, there are no projected requirements for the M509A2E1 fuze. There are, however, requirements for the XM763 and XM764 fuzes, both of which bear significant similarities with the M509A2E1 fuze.

It is therefore recommended that this equipment be modified so that it can accommodate the XM763 and XM764 fuze. This modifying action, if properly executed, can be performed with the funding still remaining in the project.

APPENDIX A  
SAMPLE DATA SHEET  
FOR  
MAGNETIC POWER SUPPLY ASSEMBLY  
ACCEPTANCE TEST CONSOLE

M589 A2E1 BDE DATA SHEET  
DATE 09.20.83  
TIME 5:21  
SERIAL NO 1000

I R (CREW)  
MIN = 460 MOHMS  
MAX = 620 MOHMS  
ACTUAL= 4922.6 MOHMS  
\*\*\*\* ABOVE MAXIMUM VALUE \*\*\*

I R (OPEN)  
MIN = .69 MOHMS  
MAX = 320 MOHMS  
ACTUAL= 7682.7 MOHMS  
\*\*\*\* ABOVE MAXIMUM VALUE \*\*\*

CONT (R1)  
MIN = 90 MOHMS  
MAX = 114 MOHMS  
ACTUAL= 99.716 MOHMS  
WITHIN SPEC

CONT (D1 FWD)  
MIN = 250 OHMS  
MAX = 730 OHMS  
ACTUAL= 336.45 OHMS  
WITHIN SPEC

CONT (D1 REV)  
MIN = 4000 MOHMS  
MAX = 5 SESS MOHMS  
ACTUAL= 5379.6 MOHMS  
WITHIN SPEC

CONT (L1)  
MIN = 40 OHMS  
MAX = 50 OHMS  
ACTUAL= 42.34 OHMS  
WITHIN SPEC

XCL (L1@2000HZ)

CAP (C1)  
MIN = .5 MFD  
MAX = .7 MFD  
ACTUAL= .57562 MFD  
WITHIN SPEC

CONT (CONTACT)  
MIN = 0 OHMS  
MAX = .1 OHMS  
ACTUAL= .0301 OHMS  
WITHIN SPEC

-TEST 1 ABOVE SPEC  
-TEST 2 ABOVE SPEC

PROJECT 330

DATE 09/21/83

MAGNETIC POWER SUPPLY ASSY

TEST DATA SHEET  
S/N EM 1000 LOT# 1

ASSY# KD 90852-3  
Rev B

REMARKS

Note: This is a sample sheet. Results of units EM 1001 through EM 1162 are available on request.

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APPENDIX B  
SAMPLE DATA SHEET  
FOR  
CENTRIFUGE ARMING TIME  
ACCEPTANCE TEST CONSOLE

PROJECT 330

DATE 9/22/83

CENTRIFUGE ARMING TIME  
ACCEPTANCE TEST  
DATA SHEET

S/N EM 1001 thru 1003 LOT# 1

ASSY# KF 90853-2  
Rev. A

REMARKS

UNIT # : EM 1000

ACCEPT

14 13 5 5 5.8 0 10 4

UNIT # 2 EM 1001

ACCEPT

14 5 12 5 5 8 10 15 6

16 83

UNIT # 3 EM 1002

ACCEPT

15 5 13 5 6 24 10.91 3

11 16

UNIT # 4 EM 1003

ACCEPT

14 2 12 2 5 65 9 94 6

14 21

M509A2E1 Detonator Lot No A441-2

M509 ~~Anest~~ Detonator Installed By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Ball Staked By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Arm Timer Tested By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Ready/Off/Safe By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

X-Ray To Verify Safe By N/A

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Note: This is a sample sheet. Results  
of units EM 1004 through EM 1162 are  
available on request.

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IS BLANK

APPENDIX C  
TOOL LIST  
OF  
MANUFACTURING, ASSEMBLY, AND INSPECTION  
TEST EQUIPMENT

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
1	273-19006	Air Press W/Sl'd'g Anvil Fixt.	Install (2) Terminal in Bobbin
1	273-60009	Pin Pull Out Tester	Pull Test (2) Terminals Installed in Bobbin
2	BW-157349 273-19002 273-19003	Modified Bulova Production Type Coil Winding Machine & Wire Tensioning Devices	Wind Coil Assembly of Setback Generator Assy Control Wire Feed to Winding Machine
2	273-19008	Tray Peg Board	Storage Tray for Coil Assy
2	273-19007	Holding Fixture	Support and Rotate Coil Assy During Application of Tape
3	BW-158862	Bulova-Resistance Welding Machine	Power Pack, Remote Control and Welding Head
3	273-19010	Modified Electrodes	Special Welding Electrodes
3	273-19011	Welding Fixture Indexing -2 Positions	Fixture to Position Assy for Welding
3	273-60007	Weld Test Fixture	To Measure Weld Strength
3	273-60004	Continuity Tester	V.O.M. and Interface Fixt.
3	273-60010	Polarization Tester	Validates Direction of Coil Winding & Start Lead of Winding
4	273-19013	Air Cylr. and Press-In Fixt.	Press Fit Armature Plate into Armature Body
4	273-19014	Tray, Storage	For Armature Sub Assy
5	273-19015	Air Cylr and Press-in Fixt.	Press Fit Shearing Plt. into Generator Cover
6	273-19016	Air Cylr and Press-in Fixt.	Press Fit Cover Sub Assy into Arm. Sub Assy
6	273-19017	Air Press and Tooling	Swage Body of Armature 360° Around Cover Sub-Assy

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
7	273-60006 273-60002 273-60003 273-60008	Setback Generator Final Assy Tester	Measures Generator R, L and Insulation Resistance. Contains Tools 273-60002, 60003, 60008 and Interface Fixture.
8	273-19001	Magnetic Charger Charging Fixt. and Charging Tray	Charge Magnet of Setback Generator Assy
8	273-60001	Gaussmeter and Holding Fixture W/ Probe Built In	Measures Leakage Flux of Magnetically Charged Generator Assy
9	273-19009	Crimping Tool- "Automator"	Crimp Contact Wire in Switch Terminal
9	273-19018	Tray Storage	Storage Tray
11	273-19019	Press-In Fixture W/Horizontal Slide Lever	Press-In (1) S2 Switch Contact in S2 Housing
10	273-19020	Staking Tool Automator	Stake Movable S2 Switch Contact to P. C. Board
10	273-19022	Press-In Fixture "Potence"	Press-In Connector Jack to P. C. Board
12A	273-19004	Axial Lead Component Forming System	Heller Leadmaster H-116A and Custom Dies. Forming Component Leads of R1, R2, D1 and S4
12B	273-19005	Radial Lead Component Forming System	Heller Radial Component Former RD-70C and Custom Die For Capacitor C1
13	331-19005	Assembly Holding Fixture	Holder P. C. Board Carrier during Assy
14	331-19006	Assembly Fixture P. C. Board Carrier	Fixture to Hold P. C. Board Carrier while Applying Spot Mask & Dress Leads

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
15	331-19004	P.C. Board Carrier Rack	Hold P.C. Board Carrier Before/After Wave - Soldering and Cleaning Process.
15	331-19002	P.C. Board Cleaning Machine	Hollis Ultra-Clean Cleans PC Board Carriers after Soldering
15	331-19003	Wavesoldering Machine	Hollis Wavesoldering Machine TDL 10" Wide for Soldering P.C. Board Carriers.
15	331-19007	Slide-Wavesoldering Machine	Soldered P.C. Carrier Slide From Soldering Machine Output End to Work Table
15	331-19008	Storage Container -Stiffeners	Storage container for P.C. Carrier Stiffeners
15	331-19009	P.C. Board Removal Tool	Remove Individual P.C. Boards from P.C. Board Carriers
15	331-19010	Soldering Fixture for S2 Switch	Fixture for Hand Soldering S2 Switch Assy
15	331-19011	Alignment Fixt. for S4 Impact Switch	Perpendicularity Alignment Fixt. for S4 Impact Switch
15	331-19012	Modified Cleaning Machine P.C. Board Basket	Modified Cleaning Machine Basket to Hold P.C. Board Carriers during Cleaning Operation
15	273-19021	Tray Storage	Storage Tray for Individual P.C. Board Assemblies
16	273-19027	Staking Tool "Automator"	Stake GND Wire in Rotor Housing
17	273-19028	Staking Tool Air Press	Stake P.C. Board (M.P.S.) in Housing Assy
18	273-19030	Press-In Fixture Probe Grommets	Install (4) Grommets in Power Supply Cover
18	273-19031	Press-In Fixture Shell Receptacle	Installed Shell Receptacle in Power Supply Cover

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
19	273-19032	Swaging Tool P.S. Cover to Rotor Housing	Swage P.S. Cover to Rotor Housing
19	273-19034	Tray-Storage	Storage Tray
20	331-19013	Encapsulation Holding Fixt.for Rotor Housing	Holding Fixture for Rotor Housing during Encapsulation of Magnetic Power Supply
20	331-19001	Encapsulant Dispensing Device	Dispenses predetermined qty of Encapsulating Material Repeatedly
21	273-60005 002	Acceptance Test Console - Magnetic Power Supply Assy	Electrical Check Out of Magnetic Power Supply Assembly after Encapsulation Computer Evaluated W/Print Out
22	273-19035	Radial Riveting Machine	Install (2) Leaf Pins in Rear Bearing Bridge Plate Assembly
	273-19036	and Fixture	
23	331-60001	Acceptance Test Console Arming Time Test	Arming Time Test Computer Evaluated W/Print Out - Housing and Mechanism Assy.
Freeport	273-90001	<u>MOLDS</u> Bobbin-KD <sup>0</sup> 0204	Next Higher Assy Bobbin Assy KC90825/KC9020 <sup>-</sup>
	273-90002	Cover, Generator (Bottom)KD90198	Next Higher Assy Setback Generator Assembly KD90830/KD90200
	273-50003	<u>DIES</u> Progressive Armature Body .. KC90203	Next Higher Assy Setback Generator Assembly KD90830/KD90200
	273-50004	Bumping Die KC90203	Same as 273-50003
	273-70001	<u>PROJECTION CHARTS</u> Projection Chart KC90205	Used for Inspection of Shear Disc.

APPENDIX D  
DEMONSTRATION TEST REPORT  
PART A



**BULOVA**

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:

UNITED STATES ARMY ARMAMENT  
R & D COMMAND

DOCUMENT NO.

330-043-1

DATE 29 SEPTEMBER 1983

PROGRAM  
M509A2E1 M. M. & T.

PURCHASE ORDER

PRIME CONTRACT  
DAAK10-80-C-0183

SUBJECT

DEMONSTRATION TEST REPORT PHASE A  
FACILITIZATION OF THE MAGNETIC  
POWER SUPPLY ASSEMBLY OF THE  
M509A2E1 PIBD FUZE

P/O CDRL ITEM: A014

PREPARED BY:

Irwin Pudbielak  
Reliability Engineer

APPROVED BY:

A. Koul  
Quality Control Manager

APPROVED BY:

M. Moskowitz  
Project Engineer

APPROVED BY:

B. Garfinkel  
Director of Quality

APPROVED BY:

S. B. Schulman  
Mgr. Special Devices Dept.

E  
D  
C  
B  
A

DATE	APVL	1	2	3	4	5	6	7	8	9	10	11	1	30	14	15	16	17	18	19	21	22	23	24	25	26	27	28	29
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BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-043-1

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**1.0 SCOPE**

1.1 THIS DOCUMENT IS THE BULOVA SYSTEMS AND INSTRUMENTS CORPORATION (BSIC) DEMONSTRATION TEST REPORT, CDRL ITEM A014, PREPARED FOR THE M.M. & T. PROGRAM OF THE M509A2E1 BASE DETONATING ELEMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT DAAK10-80-C-0183. THIS REPORT MEETS THE REQUIREMENTS OF DATA ITEM DI-T-1906.

**2.0 GENERAL**

2.1 THE TEST DEMONSTRATION (PHASE - A) WAS PERFORMED TO VERIFY THE CAPABILITY OF THE FIXTURES AND TEST EQUIPMENT TO MANUFACTURE SET-BACK GENERATORS FOR THE M509A2E1 BASE ELEMENT.

2.2 THE PHASE A TEST WAS DEMONSTRATED DURING JUNE 20TH THROUGH THE 22ND. PERSONNEL IN ATTENDANCE INCLUDED:

BSIC

M.MOSKOWITZ - PROJ. ENG.  
R.KNIGHT - Q.C. ENGINEER  
B.PATTERSON - PROJ.ENG.  
I.PODBIELAK - REL.ENG.  
T.HARGARTH - IND.ENG.  
\* NUMEROUS INSP. PERSONNEL

ARRADCOM

R.NOBLE - PROJ. ENGINEER  
J.BEDNARZ - PROD.ASSUR.ENG.  
R.PITMAN - PROJ. ENGINEER

2.3 THE TEST SAMPLE WAS BUILT AND TESTED IN ACCORDANCE WITH BSIC DEMONSTRATION TEST PLAN, CDRL ITEM A013. THE SAMPLE QUANTITY PROCESSED WAS TWO LOTS OF (130) UNITS EACH, FOR A TOTAL OF (260) UNITS. BSIC STATIONS 1 THROUGH 8 WERE USED FOR PHASE A OF THE DEMONSTRATION PLAN.

### **3.0 APPLICABLE DOCUMENTS**

#### **3.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION.**

##### **BSIC**

330-017	DEMONSTRATION TEST PLAN
330-028	S.B.G. ACCEPTANCE TEST PROCEDURE
330-029	S.B.G. CHARGE PROCEDURE
330-030	S.B.G. MAGNETIC LEAKAGE
330-037	CONTINUITY TEST PROCEDURE
330-036	WIRE WINDING PROCEDURE
330-039	PROCESS SPECIFICATION/WELDING TERMINALS
S.B.GEN	DATA SHEETS
S.B.GEN	TRAVELLER

### **4.0 SUMMARY**

THE DEMONSTRATION TEST OF THE SET-BACK GENERATORS WHICH WERE BUILT USING M.M.&T. TEST FIXTURES WAS PERFORMED TO VERIFY THE CAPABILITY OF THE M.M.&T. FIXTURES AND TEST EQUIPMENT.

THE DEMONSTRATION TEST VERIFIED THAT THESE FIXTURES AND EQUIPMENT ARE CAPABLE OF MANUFACTURING SET-BACK GENERATORS TO THE LATEST REVISION OF THE M509A2E1 DRAWINGS.

THE TEST ALSO DEMONSTRATED THAT NOT ONLY ARE THE FIXTURES CAPABLE OF MANUFACTURING S.B. GENERATORS WHICH MEET BSIC SPECIFICATIONS, BUT ARE ALSO CAPABLE WITH ONE PROCESS CHANGE OF MEETING THE MANUFACTURING RATE OF 10,000 UNITS PER MONTH, SPECIFIED IN THE STATEMENT-OF-WORK AND CONTRACT  
DAAK-10-80-C-0183.

#### **4.1 DESCRIPTION OF SAMPLES**

THE DEMONSTRATION SAMPLES WERE MANUFACTURED ON THE PRODUCTION TOOLING AND EQUIPMENT DEVELOPED FOR THE M509A2E1 M.M.&T. PROGRAM.

THE (260) SAMPLES PRODUCED DURING THE PHASE "A" DEMONSTRATION CONSISTED OF THE LATEST REVISION OF SET-BACK GENERATORS PART NUMBER KD90830.

#### **4.2 DISPOSITION OF TEST SPECIMENS**

AT THE COMPLETION OF THE PHASE "A" DEMONSTRATION, THE (260) SAMPLES WERE PLACED UNDER THE CONTROL OF QUALITY CONTROL. THESE SAMPLES SHALL BE MAINTAINED BY QUALITY CONTROL UNTIL SUCH TIME AS THE PHASE "B" DEMONSTRATION COMMENCES. AT THAT TIME THE SET-BACK GENERATORS SHALL BE USED AS PART OF THE MANUFACTURE OF COMPLETE M509A2E1 BASE DETONATOR ELEMENTS.

#### **4.3 CONCLUSIONS AND RECOMMENDATIONS**

THE EQUIPMENT AND TOOLING DESIGNED FOR THE M509A2E1 B.D.E. PRODUCED (260) SET-BACK GENERATORS WHICH MET ALL REQUIRED PARAMETERS.

THE DESIGN OF THE EQUIPMENT FOR THIS CONTRACT REQUIRED THAT THE EQUIPMENT BE CAPABLE OF PRODUCING A MINIMUM OF 10,000 UNITS PER MONTH OR 63 UNITS PER HOUR. ALTHOUGH THE DESIGN OF THE FIXTURES AND TEST EQUIPMENT PRODUCED HIGH QUALITY UNITS (ONLY 5 REJECTS OUT OF 265 UNITS BUILT FOR A REJECT RATE OF 1.8%), THERE WAS ONLY ONE MANUFACTURING OPERATION (WIRE STRIPPING OF COIL ASSEMBLIES) WHICH WAS SLOWER THAN ALL OF THE OTHER OPERATIONS BASED ON THE RUNNING TIME DATA SHEETS. THE AVERAGE STRIPPING RATE WAS DETERMINED TO BE 60 UNITS

PER HOUR. THIS OPERATION PROVED TO BE THE WORST CASE LIMIT OPERATION.

OUR RECOMMENDATIONS, THEREFORE, ARE TO REVISE THE WELDING METHOD USED TO WELD THE COIL ASSEMBLY TERMINALS. WE RECOMMEND THAT THE WELDING TECHNIQUE BE REVISED TO A METHOD WHICH CAN WELD THROUGH THE WIRE VARNISH INSULATION, THEREBY DELETING THE REQUIREMENT TO STRIP THE INSULATION FROM THE ENDS OF THE COIL ASSEMBLY.

IF THIS PROCEDURE IS REVISED AS RECOMMENDED, THE OUTPUT RATE WILL BE MORE THAN REQUIRED TO MEET THE 10,000 UNITS PER MONTH RATE.

#### 4.4 DATA SUMMARY

THE TRAVELER AND DATA SHEETS HAVE BEEN ANALYZED. THE ANALYSIS INDICATES THAT THE PRESENT OUTPUT QUALITY LEVEL OF THE DEMONSTRATION UNITS PRODUCED ON THE M.M. & T. FIXTURES AND EQUIPMENT IS ADEQUATE FOR HIGH VOLUME MANUFACTURE DURING THIS PHASE OF THE PROGRAM. TABLE-1 AND TABLE-2 ENCLOSED HEREIN SUMMARIZE THE DATA IN GRAPHICAL FORMAT FOR EASE OF READING. THE ACTUAL DATA IS ATTACHED AND MAY BE FOUND IN APPENDIX.

**4.5 DESCRIPTION OF EQUIPMENT**

A LIST AND DESCRIPTION OF ALL EQUIPMENT USED TO MANUFACTURE AND TEST SET-BACK GENERATORS FOR THE M509A2E1 BASE DETONATING ELEMENT IS AVAILABLE TO THE READER.

THE DATA CAN BE FOUND IN THE APPENDIX OF THIS DOCUMENT.

**4.6 TEST PROCEDURES**

THE FOLLOWING IS A LIST OF THE APPLICABLE TEST PROCEDURES, WHICH HAVE BEEN ENCLOSED IN THIS APPENDIX. THE PROCEDURES HAVE BEEN ENCLOSED FOR INFORMATIONAL PURPOSES.

330-028  
330-029

330-030

**4.7 DATA SHEETS**

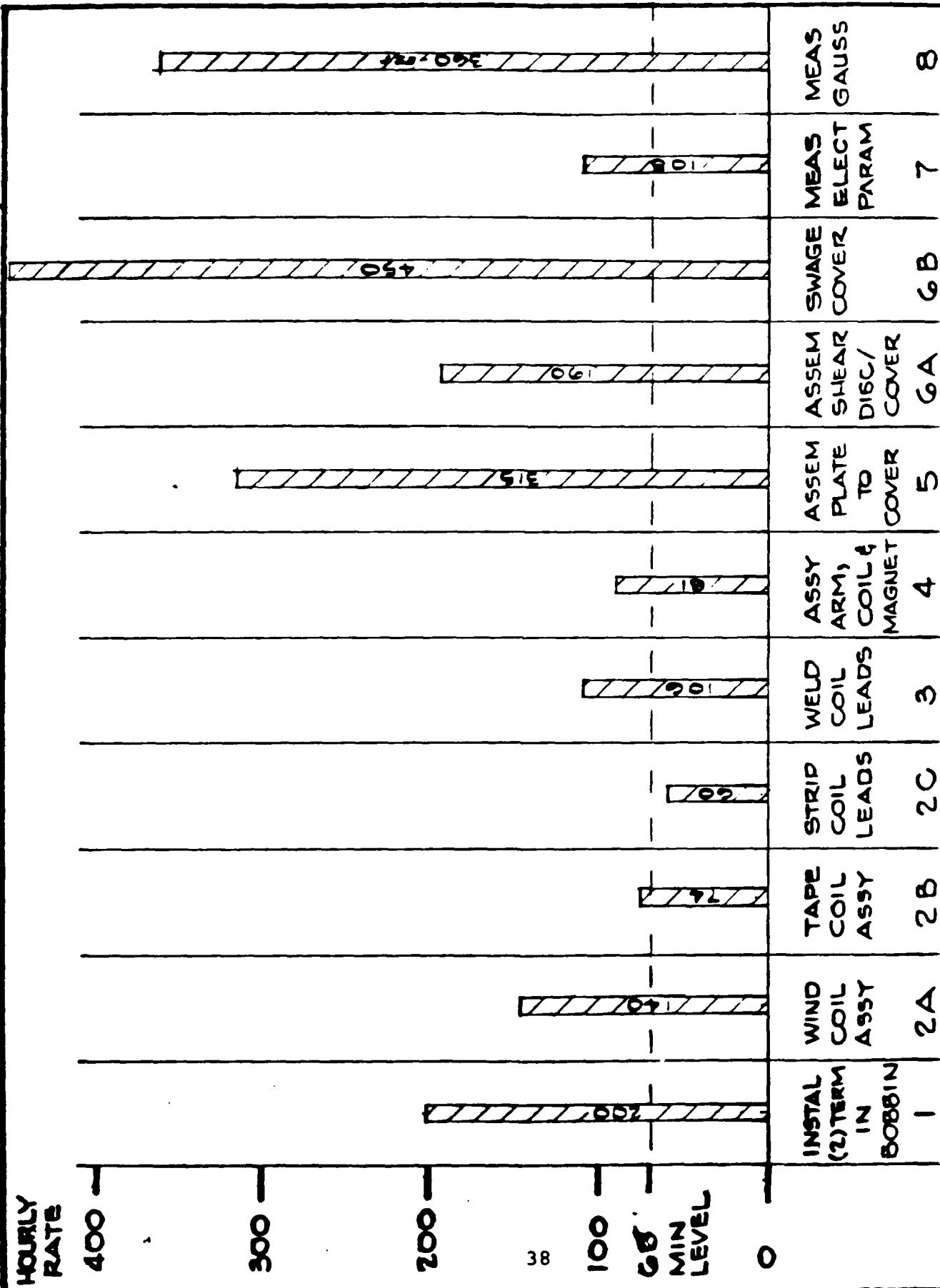
A COPY OF EACH DATA SHEET USED FOR RECORDING THE RATE PER HOUR OF MANUFACTURE FOR EACH OPERATION HAS BEEN ENCLOSED IN THE APPENDIX.

THE APPENDIX ALSO CONTAINS A COPY OF THE TRAVELLER INDICATING THE STATUS OF THE (UNITS) SET-BACK GENERATORS ALL THROUGH MANUFACTURE.

APPENDIX

HISTOGRAM - HOURLY UNIT RATE BY OPERATION

TABLE - 1



QUALITY - PERCENTAGE DEFECTS BY OPERATION

TABLE - 2

% DEFECTIVE	0	0	0	0	.3	0	0	0	0	0	1.1	3
QTY REJECT	0	0	0	0	1	0	0	0	0	3	1	
LOT QTY END	480	265	265	265	264	264	264	264	264	262	270	
LOT QTY START	480	265	265	265	264	264	264	264	264	265	271	
DESCRIPTION	INSTAL (2)TERM IN BOBBIN	WIND COIL ASSY	TAPE COIL ASSY	STRIP COIL LEADS	WELD COIL LEADS	ASSEM ARM, COIL & MAGNET	ASSEM PLATE TO DISC TO COVER	ASSEM SHEAR SWAGE COVER	ASSEM ELECT PARAM	MEAS. GAUSS	MEAS. ELECT PARAM	
STATION	1	2A	2B	2C	3	4	5	6A	6B	7	8	

SHEET

330-043-1

REV.

LIST AND DESCRIPTION OF EACH STATION

STA #	TOOL NUMBER	DESCRIPTION
1	273-19006	AIR-PRESS W/SLIDING ANVIL FIXT. FOR INSTALLING TERMINALS INTO BOBBIN
1	273-60009	PIN-PULL TESTER: TESTS TERMINAL STRENGTH IN BOBBIN
2	273-19002	COIL WINDING MACHINE, CUSTOMIZED, INCLUDING WIRE TENSIONING DEVICE
	273-19003	TO CONTROL WIRE FEED FOR MANUFACTURE OF SETBACK GENERATOR COILS
	BW-157349	GENERATOR COILS
2	273-19008	STORAGE TRAY, PEG BOARD FOR COIL ASSEMBLIES
2	273-19007	HOLDING FIXTURE TO SUPPORT AND ROTATE COIL ASSY DURING TAPE APPLICATION
3	BW-158862	WELDING MACHINE, FOR WELDING SETBACK GENERATOR COIL WIRES TO TERMINALS
3	273-19010	SPECIAL WELDING ELECTRODES
3	273-19011	SPECIAL WELDING FIXTURE WITH ELECTRODES TO POSITION SETBACK GENERATOR FOR WELDING
3	273-60007	WELD TEST FIXTURE USED TO MEASURE WELD STRENGTH
3	273-60004	A CONTINUITY TESTER TO MEASURE COIL RESISTANCE
3	273-60010	A POLARIZATION TESTER USED TO ESTABLISH COIL DIRECTION AND START LEAD OF SETBACK GENERATOR
4	273-19013	AIR CYLINDER & PRESS IN FIXTURE - FOR PRESS FIT ARMATURE PLATE INTO ARMATURE BODY
4	273-19014	STORAGE TRAY FOR ARMATURE SUB. ASSEMBLY
5	273-19015	AIR CYLINDER AND PRESS IN FIXTURE FOR PRESSING SHEAR DISC INTO GENERATOR COVER

STA	TOOL NUMBER	DESCRIPTION
6	273-19016	AIR CYLINDER AND PRESS IN FIXTURE FOR PRESSING SUB ASSEMBLY COVER INTO SUB ASSEMBLY
6	273-19017	AIR-PRESS AND TOOLING TO SWAGE ARMATURE BODY 360 DEGREES
7	273-60002	SETBACK GENERATOR, TO
	60003	MEASURE R/L AND INSULATION RESISTANCES
	60006	
	60008	
8	273-19001	MAGNETIC CHARGER, CHARGING FIXTURE AND TRAY USED TO CHARGE MAGNET OF SETBACK GENERATOR
8	273-60001	GAUSSMETER AND FIXTURE TO MEASURE LEAKAGE FLUX OF CHARGED GENERATOR



APPENDIX E  
ACCEPTANCE TEST PROCEDURE  
FOR  
SETBACK GENERATOR ASSEMBLY



BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:	DOCUMENT NO.
	330-028
	DATE 31 MAY-1983
	PROGRAM M. M. & T. - M. P. S. M509A2E1 B. D. E.
	PURCHASE ORDER
	PRIME CONTRACT DAAK10-80-C-0183

SUBJECT

ACCEPTANCE TEST PROCEDURE

SETBACK GENERATOR ASSEMBLY

KD90830

PREPARED BY:

Irwin Podbielak  
Reliability Engineer

APPROVED BY:

A. Koul  
Quality Control Manager

APPROVED BY:

B. Garfinkel  
Director of Quality

APPROVED BY:

M. Moskowitz  
Project Mgr. M. M. & T.

APPROVED BY:

S. B. Schulman  
Mgr. Special Devices Dept.

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BULOVA /

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-028

## **1.0 SCOPE**

**1.1 THIS DOCUMENT DEFINES THE BSIC ACCEPTANCE TEST PROCEDURE WHICH SHALL BE ADHERED TO WHEN VERIFYING THE INSULATION RESISTANCE, RESISTANCE AND INDUCTANCE OF THE SETBACK GENERATOR PART NUMBER KD90830.**

## **2.0 APPLICABLE DOCUMENTS**

**2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENT(S), THIS DOCUMENT SHALL GOVERN.**

### **BSIC**

KD90830	SETBACK GENERATOR ASSEMBLY
273-60006	FINAL ASSY TESTER, S.B. GENERATOR

## **3.0 REQUIREMENTS**

### **3.1 MATERIAL**

KD90830	SETBACK GENERATOR ASSEMBLY
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### **3.2 EQUIPMENT**

273-60006	FINAL ASSY TESTER, S.B. GENERATOR
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## **4.0 PROCEDURE**

**4.1 THE SETBACK GENERATOR ASSEMBLY SHALL BE COMPLETE IN ACCORDANCE WITH THE REQUIREMENTS OF DOCUMENT KD90830.**

**4.2 EVERY UNIT SHALL BE TESTED IN ACCORDANCE WITH THIS DOCUMENT USING SETBACK GENERATOR FINAL ASSEMBLY TESTER  
273-60006.**

**CAUTION: THE USE OF THIS FIXTURE INVOLVES HIGH VOLTAGE.**  
**DO NOT TOUCH THE TEST SOCKET OR S.B. GENERATOR DURING**  
**TESTING. SET THE MEASURE-CHARGE-DISCHARGE SWITCH ON THE**  
**MEGOMMETER TO THE DISCHARGE POSITION.**

- 4.3 ACTIVATE MAIN PANEL POWER SWITCH AND THE POWER SWITCH ON EACH OF THE THREE METERS TO THE ON POSITION.
- 4.4 ACTIVATE THE HOME SWITCH ON THE MAIN PANEL. THE NUMBER-1 LED ON THE MAIN PANEL SHOULD BE LIT. THE MEGOHMMETER IS CONNECTED TO THE TEST SOCKET IN THIS POSITION.
- 4.5 INSERT A SETBACK GENERATOR UNDER TEST INTO THE TEST SOCKET.
- 4.6 SET THE VOLTAGE SELECTOR KNOB ON THE MEGOHMMETER TO 200 VOLTS AND THE DIAL SELECTOR TO THE 100 MEGOHM POSITION.
- 4.7 ACTIVATE THE MEASURE-CHARGE-DISCHARGE SWITCH TO THE MEASURE POSITION. THE MEGOHMMETER DIAL SHALL INDICATE 5 (500 MEGOHMS) OR HIGHER. SET THE MEASURE-CHARGE-DISCHARGE SWITCH BACK TO DISCHARGE (SAFE) POSITION.
- 4.8 ACTIVATE THE STEP SWITCH ON THE MAIN PANEL TWICE. LED NUMBER-3 SHOULD BE LIT INDICATING THAT THE TEST UNIT IS NOW CONNECTED TO THE DIGITAL MULTIMETER. WITH THE MULTIMETER RANGE SELECTORS IN THE DC, K OHM AND THE SCALE FACTOR ON 200 OHMS THE MULTIMETER SHOULD INDICATE BETWEEN 40 AND 50 OHMS.
- 4.9 ACTIVATE THE STEP SWITCH ONCE. LED NUMBER 4 SHOULD BE LIT INDICATING THAT THE TEST UNIT IS NOW CONNECTED TO THE DIGIBRIDGE.

4.10 ACTIVATE THE L (INDUCTANCE) SWITCH AND LOW RANGE SWITCH ON THE DIGIBRIDGE. THE DIGIBRIDGE SHOULD INDICATE BETWEEN 7 AND 8 MILLIHENRY.

4.11 REMOVE UNIT UNDER TEST FROM TEST SOCKET.

**5.0 PRODUCE ASSURANCE**

5.1 ANY UNIT NOT MEETING THE REQUIREMENTS OF THIS DOCUMENT SHALL BE REJECTED.



APPENDIX F  
MAGNETIC CHARGING PROCEDURE  
FOR  
SETBACK GENERATOR



BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:

DOCUMENT NO.  
330-029

DATE 2 JUNE 1983

PROGRAM M. M. & T. M. P. S.  
M509A2E1 - B. D. E.

PURCHASE ORDER

PRIME CONTRACT  
DAAK10-80-C-0183

SUBJECT

SETBACK GENERATOR P/N KD 90830

MAGNETIC CHARGING PROCEDURE

PREPARED BY: \_\_\_\_\_

Irwin Podbielak  
Reliability Engineer

APPROVED BY: \_\_\_\_\_

A. Koul  
Quality Control Manager

APPROVED BY: \_\_\_\_\_

M. Moskowitz  
Project Mgr. M. M. & T.

APPROVED BY: \_\_\_\_\_

B. Garfinkel  
Director of Quality

APPROVED BY: \_\_\_\_\_

S. B. Schulman  
Mgr. Special Devices Dept.

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BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-029

**1.0 SCOPE**

1.1 THIS DOCUMENT DEFINES THE PROCEDURE WHICH SHALL BE ADHERED TO WHEN MAGNETIZING THE SETBACK GENERATOR PART NUMBER KD90830.

**2.0 APPLICABLE DOCUMENTS**

2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENTS, THIS DOCUMENT SHALL GOVERN.

BSIC

KD90830

SETBACK GENERATOR

**3.0 REQUIREMENTS**

**3.1 MATERIALS**

KD90830

SETBACK GENERATOR

**3.2 EQUIPMENT**

159963

CHARGING STATION, RFL INDUSTRIES  
MODEL 1500

**4.0 PRELIMINARY**

**(CAUTION !! REMOVE WRIST WATCHES)**

4.1 TURN CHARGING STATION ON BY ACTIVATING EQUIPMENT ON/OFF SWITCH TO ON POSITION. SET CHARGING VOLTAGE ON/OFF SWITCH TO HIGH POSITION.

**5.0 PROCEDURE**

5.1 INSTALL SETBACK GENERATORS KD90830 TO BE CHARGED INTO THE CHARGING FIXTURE HOLDER, TERMINALS UP. THIS FIXTURE CONSISTS OF TWO LAYERS HOLDING 15 UNITS PER LAYER. EACH LAYER IS MADE OUT OF TEFLON AND HAS 15 HOLES APPROXIMATELY

THE SIZE OF THE SETBACK GENERATOR. LOCK THE TOP AND BOTTOM LAYER TOGETHER FINGER TIGHT, WITH THE KNULED SCREW. THERE SHOULD BE NO SPACE BETWEEN THE TOP AND BOTTOM LAYER.

- 5.2 PLACE THE CHARGING FIXTURE HOLDER INTO THE CHARGING FIXTURE HOLDER CAVITY AND SLIDE THE TOP COVER OF THE CAVITY CLOSED.
- 5.3 PUSH THE "PUSH-TO-CHARGE" BUTTON. THE D.C. VOLTMETER SHOULD DROP SHARPLY TOWARD ZERO AND THEN RECOVER TO APPROXIMATELY 1300 VOLTS.
- 5.4 AFTER METER RETURNS TO APPROXIMATELY 1300 VOLTS REPEAT STEPS 5.3.
- 5.5 REMOVE SETBACK GENERATORS BY SLIDING BACK THE CAVITY COVER. REMOVE THE CHARGING FIXTURE HOLDER. UNSCREW THE KNULED SCREW AND REMOVE THE SETBACK GENERATORS FROM THE CHARGING FIXTURE HOLDER.
- 5.6 VERIFICATION OF SETBACK GENERATOR CHARGE SHALL BE ASCERTAINED BY MEASURING THE SETBACK GENERATOR IN ACCORDANCE WITH ACCEPTANCE TEST PROCEDURES, DOCUMENT NUMBER 330-030.

#### 6.0 PRODUCT ASSURANCE

- 6.1 VERIFY THAT CHARGING STATION IS CALIBRATED BEFORE USE.

APPENDIX G  
ACCEPTANCE TEST PROCEDURE  
FOR  
GAUSS CHARGE VERIFICATION



**BULOVA**

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:	DOCUMENT NO.	
	330-030	
	DATE	14 June 1983
	PROGRAM	M. M. & T. - M. P. S. M509A2E1 B. D. E.
	PURCHASE ORDER	
	PRIME CONTRACT	
	DAAK10-80-C-0183	

SUBJECT

GAUSS CHARGE VERIFICATION

ACCEPTANCE TEST PROCEDURE

PREPARED BY:

Irwin Podbielak  
Reliability Engineer

APPROVED BY:

A. Koul  
Quality Control Manager

APPROVED BY:

B. Garfinkel  
Director Of Quality

APPROVED BY:

M. Moskowitz  
Proj. Mgr. M. M. & T.

APPROVED BY:

S. B. Schulman  
Mgr. Special Devices

E  
D  
C  
B  
A

DATE APVL 1 2 3 4 5 6 7 8 9 10 11 60 114 15 16 17 18 19 21 22 23 24 25 26 27 28 29

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-030

## **1.0 SCOPE**

1.1 THIS DOCUMENT DEFINES THE TEST PROCEDURE WHICH  
SHALL BE ADHERED TO IN PERFORMING A VERIFICATION  
OF GAUSS CHARGE LEVEL OF A SETBACK GENERATOR  
ASSEMBLY KD 90830.

## **2.0 APPLICABLE DOCUMENTS**

2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENTS, THIS DOCUMENT SHALL GOVERN.

BSIC

KD 90830  
273-60001

# **SETBACK GENERATOR ASSEMBLY GAUSSMETER**

### **3.0 REQUIREMENTS**

### 3.1 MATERIAL

KD 90830

## **SETBACK GENERATOR ASSEMBLY**

### **3.2 EQUIPMENT**

273-60001

## **GAUSSMETER, RFL MODEL 750AR**

#### 4.0 PROCEDURE

- 4.1 VERIFY CALIBRATION, EACH TIME THE OPERATOR STARTS TO MEASURE A LOT.
- 4.2 TURN POWER SWITCH ON GAUSSMETER MODEL 750 AR TO ON.
- 4.3 WAIT THREE MINUTES FOR GAUSSMETER TO STABILIZE. SET GAUSS FULL SCALE SWITCH TO CAL POSITION. THE METER SHOULD INDICATE CAL AT THE RIGHT END OF THE DIAL. ADJUST IF NECESSARY USING THE CAL KNOB. (THE INNER KNOB OF THE DUAL KNOB CONTROL)
- 4.4 SET THE GAUSS FULL SCALE KNOB TO THE 200 POSITION  
SET THE  
OPERATOR - STANDARD GENERATOR INTO THE HOLDING FIXTURE.
- 4.5 THE METER SHALL INDICATE BETWEEN PLUS AND MINUS 5 GAUSS OF THE OPERATOR STANDARD GENERATOR. (LEVEL MARKED)
- 4.6 IF THE METER INDICATION IS WITHIN  $\pm$  5 GAUSS OF THE ESTABLISHED STANDARD REMOVE THE STANDARD AND TEST EACH UNIT UNDER TEST BY SETTING IT INTO THE HOLDING FIXTURE AND READING THE GAUSS LEVEL
- 4.7 IF THE METER INDICATION IS NOT WITHIN  $\pm$  5 GAUSS OF THE ESTABLISHED STANDARD LEVEL, DO NOT PROCEED WITH TESTING. CALIBRATION PERSONNEL SHALL RECALIBRATE THE GAUSSMETER IN ACCORDANCE WITH THE OPERATOR MANUAL.

5.0 QUALITY CONTROL

5.1 ANY UNIT NOT MEETING THE REQUIREMENTS OF THIS  
DOCUMENT SHALL BE REJECTED.



APPENDIX H  
TRAVELER  
FOR  
DEMONSTRATION TEST PLAN  
PART A



## PROJECT 330

## M509A2E1 BDE CONFIGURATION - DEMONSTRATION TEST PLAN TRAVELER

## SHEET OF

WEEK ENDING 9/29/83 AND 6/30/85

SIX ASSY #	DESCRIPTION	LOT #	QTY MADE	QTY SAMPLED	QTY ACCEPT	QTY REJECT	MFG/INSP	SIG DATE	REMARKS							
1 KC90825	BOBBIN ASSY	1 2 3 4	100 120 120	100 120 120	100 120 120	0 0 0	INSP	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210	MFG							
1 KC90825	INSPECT	1 2 3 4	120 120 120	120 120 120	120 120 120	0 0 0	INSP									
2 KC90829	WIND COIL ASSY	1 2	130 135	130 135	130 135	0 0	MFG									
3 KC90829	WELD & TEST															
3 KC90829	INSPECT	1 2	130 135	130 135	130 135	0 0	INSP	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 80 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 100 111 112 113 114 115 116 117 118 119 110 121 122 123 124 125 126 127 128 129 120 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 140 151 152 153 154 155 156 157 158 159 150 161 162 163 164 165 166 167 168 169 160 171 172 173 174 175 176 177 178 179 170 181 182 183 184 185 186 187 188 189 180 191 192 193 194 195 196 197 198 199 190 201 202 203 204 205 206 207 208 209 200 211 212 213 214 215 216 217 218 219 210 221 222 223 224 225 226 227 228 229 220 231 232 233 234 235 236 237 238 239 230 241 242 243 244 245 246 247 248 249 240 251 252 253 254 255 256 257 258 259 250 261 262 263 264 265 266 267 268 269 260 271 272 273 274 275 276 277 278 279 270 281 282 283 284 285 286 287 288 289 280 291 292 293 294 295 296 297 298 299 290 301 302 303 304 305 306 307 308 309 300 311 312 313 314 315 316 317 318 319 310 321 322 323 324 325 326 327 328 329 320 331 332 333 334 335 336 337 338 339 330 341 342 343 344 345 346 347 348 349 340 351 352 353 354 355 356 357 358 359 350 361 362 363 364 365 366 367 368 369 360 371 372 373 374 375 376 377 378 379 370 381 382 383 384 385 386 387 388 389 380 391 392 393 394 395 396 397 398 399 390 401 402 403 404 405 406 407 408 409 400 411 412 413 414 415 416 417 418 419 410 421 422 423 424 425 426 427 428 429 420 431 432 433 434 435 436 437 438 439 430 441 442 443 444 445 446 447 448 449 440 451 452 453 454 455 456 457 458 459 450 461 462 463 464 465 466 467 468 469 460 471 472 473 474 475 476 477 478 479 470 481 482 483 484 485 486 487 488 489 480 491 492 493 494 495 496 497 498 499 490 501 502 503 504 505 506 507 508 509 500 511 512 513 514 515 516 517 518 519 510 521 522 523 524 525 526 527 528 529 520 531 532 533 534 535 536 537 538 539 530 541 542 543 544 545 546 547 548 549 540 551 552 553 554 555 556 557 558 559 550 561 562 563 564 565 566 567 568 569 560 571 572 573 574 575 576 577 578 579 570 581 582 583 584 585 586 587 588 589 580 591 592 593 594 595 596 597 598 599 590 601 602 603 604 605 606 607 608 609 600 611 612 613 614 615 616 617 618 619 610 621 622 623 624 625 626 627 628 629 620 631 632 633 634 635 636 637 638 639 630 641 642 643 644 645 646 647 648 649 640 651 652 653 654 655 656 657 658 659 650 661 662 663 664 665 666 667 668 669 660 671 672 673 674 675 676 677 678 679 670 681 682 683 684 685 686 687 688 689 680 691 692 693 694 695 696 697 698 699 690 701 702 703 704 705 706 707 708 709 700 711 712 713 714 715 716 717 718 719 710 721 722 723 724 725 726 727 728 729 720 731 732 733 734 735 736 737 738 739 730 741 742 743 744 745 746 747 748 749 740 751 752 753 754 755 756 757 758 759 750 761 762 763 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1011 1012 1013 1014 1015 1016 1017 1018 1019 1010 1021 1022 1023 1024 1025 1026 1027 1028 1029 1020 1031 1032 1033 1034 1035 1036 1037 1038 1039 1030 1041 1042 1043 1044 1045 1046 1047 1048 1049 1040 1051 1052 1053 1054 1055 1056 1057 1058 1059 1050 1061 1062 1063 1064 1065 1066 1067 1068 1069 1060 1071 1072 1073 1074 1075 1076 1077 1078 1079 1070 1081 1082 1083 1084 1085 1086 1087 1088 1089 1080 1091 1092 1093 1094 1095 1096 1097 1098 1099 1090 1101 1102 1103 1104 1105 1106 1107 1108 1109 1100 1111 1112 1113 1114 1115 1116 1117 1118 1119 1110 1121 1122 1123 1124 1125 1126 1127 1128 1129 1120 1131 1132 1133 1134 1135 1136 1137 1138 1139 1130 1141 1142 1143 1144 1145 1146 1147 1148 1149 1140 1151 1152 1153 1154 1155 1156 1157 1158 1159 1150 1161 1162 1163 1164 1165 1166 1167 1168 1169 1160 1171 1172 1173 1174 1175 1176 1177 1178 1179 1170 1181 1182 1183 1184 1185 1186 1187 1188 1189 1180 1191 1192 1193 1194 1195 1196 1197 1198 1199 1190 1201 1202 1203 1204 1205 1206 1207 1208 1209 1200 1211 1212 1213 1214 1215 1216 1217 1218 1219 1210 1221 1222 1223 1224 1225 1226 1227 1228 1229 1220 1231 1232 1233 1234 1235 1236 1237 1238 1239 1230 1241 1242 1243 1244 1245 1246 1247 1248 1249 1240 1251 1252 1253 1254 1255 1256 1257 1258 1259 1250 1261 1262 1263 1264 1265 1266 1267 1268 1269 1260 1271 1272 1273 1274 1275 1276 1277 1278 1279 1270 1281 1282 1283 1284 1285 1286 1287 1288 1289 1280 1291 1292 1293 1294 1295 1296 1297 1298 1299 1290 1301 1302 1303 1304 1305 1306 1307 1308 1309 1300 1311 1312 1313 1314 1315 1316 1317 1318 1319 1310 1321 1322 1323 1324 1325 1326 1327 1328 1329 1320 1331 1332 1333 1334 1335 1336 1337 1338 1339 1330 1341 1342 1343 1344 1345 1346 1347 1348 1349 1340 1351 1352 1353 1354 1355 1356 1357 1358 1359 1350 1361 1362 1363 1364 1365 1366 1367 1368 1369 1360 1371 1372 1373 1374 1375 1376 1377 1378 1379 1370 1381 1382 1383 1384 1385 1386 1387 1388 1389 1380 1391 1392 1393 1394 1395 1396 1397 1398 1399 1390 1401 1402 1403 1404 1405 1406 1407 1408 1409 1400 1411 1412 1413 1414 1415 1416 1417 1418 1419 1410 1421 1422 1423 1424 1425 1426 1427 1428 1429 1420 1431 1432 1433 1434 1435 1436 1437 1438 1439 1430 1441 1442 1443 1444 1445 1446 1447 1448 1449 1440 1451 1452 1453 1454 1455 1456 1457 1458 1459 1450 1461 1462 1463 1464 1465 1466 1467 1468 1469 1460 1471 1472 1473 1474 1475 1476 1477 1478 1479 1470 1481 1482 1483 1484 1485 1486 1487 1488 1489 1480 1491 1492 1493 1494 1495 1496 1497 1498 1499 1490 1501 1502 1503 1504 1505 1506 1507 1508 1509 1500 1511 1512 1513 1514 1515 1516 1517 1518 1519 1510 1521 1522 1523 1524 1525 1526 1527 1528 1529 1520 1531 1532 1533 1534 1535 1536 1537 1538 1539 1530 1541 1542 1543 1544 1545 1546 1547 1548 1549 1540 1551 1552 1553 1554 1555 1556 1557 1558 1559 1550 1561 1562 1563 1564 1565 1566 1567 1568 1569 1560 1571 1572 1573 1574 1575 1576 1577 1578 1579 1570 1581 1582 1583 1584 1585 1586 1587 1588 1589 1580 1591 1592 1593 1594 1595 1596 1597 1598 1599 1590 1601 1602 1603 1604 1605 1606 1607 1608 1609 1600 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1811 1812 1813 1814 1815 1816 1817 1818 1819 1810 1821 1822 1823 1824 1825 1826 1827 1828 1829 1820 1831 1832 1833 1834 1835 1836 1837 1838 1839 1830 1841 1842 1843 1844 1845 1846 1847 1848 1849 1840 1851 1852 1853 1854 1855 1856 1857 1858 1859 1850 1861 1862 1863 1864 1865 1866 1867 1868 1869 1860 1871 1872 1873 1874 1875 1876 1877 1878 1879 1870 1881 1882 1883 1884 1885 1886 1887 1888 1889 1880 1891 1892 1893 1894 1895 1896 1897 1898 1899 1890 1901 1902 1903 1904 1905 1906 1907 1908 1909 1900 1911 1912 1913 1914 1915 1916 1917 1918 1919 1910 1921 1922 1923 1924 1925 1926 1927 1928 1929 1920 1931 1932 1933 1934 1935 1936 1937 1938 1939 1930 1941 1942 1943 1944 1945 1946 1947 1948 1949 1940 1951 1952 1953 1954 1955 1956 1957 1958 1959 1950 1961 1962 1963 1964 1965 1966 1967 1968 1969 1960 1971 1972 1973 1974 1975 1976 1977 1978 1979 1970 1981 1982 1983 1984 1985 1986 1987 1988 1989 1980 1991 1992 1993 1994 1995 1996 1997 1998 1999 1990 2001 2002 2003 2004 2005 2006 2007 2008 2009 2000 2011 2012 2013 2014 2015 2016 2017 2018 2019 2010 2021 2022 2023 2024 2025 2026 2027 2028 2029 2020 2031 2032 2033 2034 2035 2036 2037 2038 2039 2030 2041 2042 2043 2044 2045 2046 2047 2048 2049 2040 2051 2052 2053 2054 2055 2056 2057 2058 2059 2050 2061 2062 2063 2064 2065 2066 2067 2068 2069 2060 2071 2072 2073 2074 2075 2076 2077 2078 2079 2070 2081 2082 2083 2084 2085 2086 2087 2088 2089 2080 2091 2092 2093 2094 2095 2096 2097 2098 2099 2090 2101 2102 2103 2104 2105 2106 2107 2108 2109 2100 2111 2112 2113 2114 2115 2116 2117 2118 2119 2110 2121 2122 2123 2124 2125 2126 2127 2128 2129								



APPENDIX I  
SAMPLE DATA COLLECTION FORM  
PART A



**Note:** This is a sample. Other stations are available on request.

**E. PREVENTIVE MAINTENANCE**  
**F. ADMINISTRATIVE SITE READOUT**  
? ANNADCOM RESERVED  
**G. INTERNATIONAL DOMESTIC FIELD CHANNEL**

“**सर्वानन्दं तदेव अपि विद्या**  
स च विद्यते विद्या विद्या विद्या विद्या

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APPENDIX J  
DEMONSTRATION TEST REPORT  
PART B



BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM NEW YORK

TO:

UNITED STATES ARMY ARMAMENT  
R & D COMMAND

DOCUMENT NO.  
330-043-2

DATE 30 SEPTEMBER 1983

PROGRAM  
M509A2E1 - M. M. & T.

PURCHASE ORDER

PRIME CONTRACT  
DAAK10-80-C-0183

SUBJECT

DEMONSTRATION TEST REPORT PHASE B  
FACILITIZATION OF THE MAGNETIC POWER  
SUPPLY ASSEMBLY OF THE M509A2E1 PIBD FUZE

P/O CDRL ITEM: A014

PREPARED BY:

Irwin Podbielak  
Reliability Engineer

APPROVED BY:

A. Koul  
Quality Control Manager

APPROVED BY:

M. Moskowitz  
Project Eng. M. M. & T.

APPROVED BY:

E. Garfinkel  
Director of Quality

APPROVED BY:

S. B. Schulman  
Mgr. Special Devices Dep.



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1.0 SCOPE

1.1 THIS DOCUMENT IS THE BULOVA SYSTEMS AND INSTRUMENTS CORPORATION (BSIC) DEMONSTRATION TEST REPORT, P/O CDPL ITEM A014, PREPARED FOR THE M.M. & T. PROGRAM OF THE M509A2E1 BASE DETONATING ELEMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT DAAK10-80-C-0183. THIS DOCUMENT IS THE SECOND HALF OF THE DEMONSTRATION TEST (PHASE B) TEST REPORT. THE COMBINED DOCUMENTS 340-043-1 AND 340-043-2 FORM THE COMPLETE DEMONSTRATION TEST REPORT. THIS REPORT MEETS THE REQUIREMENTS OF DATA ITEM DI-T-1906 CITED IN THE CDRL ITEM.

2.0 GENERAL

2.1 THE TEST DEMONSTRATION, PHASE - B WAS PERFORMED TO VERIFY THE CAPABILITY OF THE FIXTURES AND TEST EQUIPMENT TO MANUFACTURE M509A2E1 BASE ELEMENTS. THE PHASE B DEMONSTRATION STARTED AT THE COMPLETION OF THE SET-BACK GENERATOR (STATION 8) AND CONTINUED THROUGH THE COMPLETE BASE ELEMENT (STATION 23).

2.2 THE PHASE B TEST WAS DEMONSTRATED DURING THE MONTH OF SEPTEMBER 1983. PERSONNEL IN ATTENDANCE INCLUDED:

BSIC

M.MOSKOWITZ - PROJ. ENG.  
K.KNIGHT - Q.C. ENGINEER  
B.PATTERSON - PROJ.ENG.  
I.PODBIELAK - REL.ENG.  
T.HARGARTHER - IND.ENG.

ARRADCOM

R.NOBLE - PROJ. ENGINEER  
J.BEDNARZ - PROD.ASSUR.ENG.  
R.PITMAN - PROJ. ENGINEER

ADDITIONAL INSPECTION PERSONNEL

2.3 THE PHASE B TEST SAMPLE WAS BUILT AND TESTED IN ACCORDANCE WITH BSIC DEMONSTRATION TEST PLAN, CDRL ITEM A013. THE SAMPLE QUANTITIES PROCESSED VARIED IN ACCORDANCE WITH:

S2 CONTACT ASSEMBLY	260
S2 SWITCH ASSEMBLY	480
MAGNETIC POWER SUPPLY	263
HOUSING PIN & CONTACT ASSEMBLY	291
MOLDED ASSEMBLY HOUSING	162
DELIVERED AIR-GUN UNITS	50

IT SHOULD BE NOTED THAT MANY ASSEMBLIES WERE PRODUCED AT QUANTITIES FAR IN EXCESS OF THOSE REQUIRED FOR THE 50 DELIVERABLE UNITS, DUE TO THE OPERATING SPEED OF THE TOOLING AND FIXTURES.

### 3.0 APPLICABLE DOCUMENTS

3.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION:

#### BSIC

330-033	ENCAPSULATION PROCEDURE
330-034	FINAL ELECTRICAL COMPONENT TEST
330-035	ENCAPSULATION PROCESS
330-040	WAVE SOLDERING PROCESS SPECIFICATION
330-042	VAPOR DEGREASER PROCESS SPECIFICATION
DATA SHEETS	DATA SHEETS - PHASE B B.D.E.
TRAVELLER	TRAVELLER - PHASE B B.D.E.

#### **4.0 SUMMARY**

THE PHASE B DEMONSTRATION TEST OF THE BASE DETONATING ELEMENTS (LESS THE SET-BACK GENERATORS WHICH WERE BUILT DURING PHASE A DEMONSTRATION TEST) WERE BUILT USING M.M.& T. TEST FIXTURES TO VERIFY THE CAPABILITY OF THE M.M.& T. FIXTURES AND TEST EQUIPMENT.

THE DEMONSTRATION TEST VERIFIED THAT THE FIXTURES AND EQUIPMENT ARE CAPABLE OF MANUFACTURING BASE DETONATING ELEMENTS TO THE LATEST REVISION OF THE M509A2E1 DRAWINGS.

THE TEST ALSO DEMONSTRATED THAT THE FIXTURES AND EQUIPMENT ARE CAPABLE OF PRODUCING THE B.D. ELEMENTS AT A RATE OF AT LEAST 10,000 PER MONTH, AS SPECIFIED IN THE CONTRACT DAAK10-80C-0183.

#### **4.1 DESCRIPTION OF SAMPLES**

THE PHASE B DEMONSTRATION SAMPLES WERE MANUFACTURED ON THE PRODUCTION TOOLING AND EQUIPMENT DEVELOPED FOR THE M509A2E1, M.M. & T. PROGRAM.

THE PHASE A SAMPLES OF THE S.B. GENERATORS WERE USED IN CONJUNCTION WITH THE SAMPLES MANUFACTURED FOR PHASE B BASE DETONATING ELEMENTS.

#### **4.2 DISPOSITION OF SAMPLES**

AT THE COMPLETION OF THE PHASE "B" DEMONSTRATION, THE 50 AIR-GUN CONFIGURATION LD-90230-7 BASE DETONATING ELEMENTS WERE DELIVERED TO ARRADCOM. THE REMAINDER OF THE PHASE B DEMONSTRATION MATERIAL WHICH WAS NOT DELIVERED, IS PRESENTLY BEING STORED AT BSIC UNDER THE COGNIZANCE OF THE BSIC GOVERNMENT PROPERTY ADMINISTRATOR.

THIS EQUIPMENT CONSISTS OF 108 ENCAPSULATED UNITS WITHOUT MECHANISM AND 108 ADDITIONAL UNITS WHICH WERE ASSEMBLED BUT NOT ENCAPSULATED. FINAL DISPOSITION INSTRUCTIONS FOR THIS MATERIAL ARE PENDING.

4.3 CONCLUSIONS AND RECOMMENDATIONS

THE EQUIPMENT AND TOOLING DESIGNED AND BUILT FOR THE M509A2E1 M.M. & T. PROGRAM, PRODUCED UNITS WHICH MET ALL FINAL REQUIRED PARAMETERS. FIFTY M509A2E1 BASE DETONATING ELEMENTS (AIR-GUN CONFIGURATION) WERE DELIVERED TO ARRADCOM.

IT SHOULD BE NOTED THAT THE MECHANISM ASSEMBLIES USED WERE SUPPLIED FROM THE M509A2E1 PROGRAM SINCE NO TOOLING WAS INCLUDED IN THE M.M. & T. PROGRAM FOR BUILDING MECHANISMS.

ONE MODIFICATION WAS MADE DURING THE MANUFACTURING CYCLE. THE PRINTED CIRCUIT BOARD (P.C.B.) ASSEMBLIES WERE NOT STAKED INTO THE HOUSINGS. THE P.C.B. USED TO MANUFACTURE THE PART B DEMONSTRATION UNITS WERE NOMINALLY .047 THICK AS PER THE LATEST M509A2E1 AND XM815 CONFIGURATION. THE HOUSINGS USED HOWEVER WERE RELEASED FOR PRODUCTION AND MANUFACTURED DURING 1982. AT THAT TIME FRAME THE P.C.B. CONFIGURATION WAS REQUIRED TO BE .032 THICK. BOTH ARRADCOM AND BSIC WERE AWARE OF THIS CONDITION BEFORE THE START OF THE DEMONSTRATION TEST. WE BELIEVE THAT A LIGHT STAKE WOULD BE POSSIBLE, THEREFORE ARRADCOM DIRECTED BSIC TO PROCEED WITH THE DEMONSTRATION TEST BASED ON THESE BASELINE PARAMETERS. WE SUBSEQUENTLY DETERMINED THAT THE TOLERANCING WAS SUCH THAT EVEN THE LIGHT STAKING WOULD BE DESTRUCTIVE TO THE P.C.B., THEREFORE NO STAKING WAS PERFORMED.

THE TOOLS AND FIXTURES DESIGNED AND BUILT FOR THE M.M.&T. CONTRACT ARE REQUIRED TO BE CAPABLE OF PRODUCING M509A2E1, B.D.E. UNITS AT A MINIMUM RATE OF 63 PER HOUR.

A REVIEW OF THE TRAVELLER AND DATA SHEETS, PROVIDED IN THE APPENDIX, INDICATES THAT THERE ARE PROCESSES WHICH ARE CONSIDERABLY SLOWER THAN THE 63 UNITS PER HOUR REQUIRED.

SOME PROCESSES DID NOT MEET THE 63 UNITS PER HOUR RATE. WE RECOMMEND THAT ADDITIONAL FIXTURES AND PERSONNEL BE EMPLOYED TO MEET THIS REQUIREMENT AS THE PRODUCTION RATE DICTATES. SPECIFICS OF EACH PROCESS MAY BE FOUND IN THE DATA SUMMARY, PARAGRAPH 4.4.

BSIC RECOMMENDS THAT THE M.M.& T. PROGRAM BE EXPANDED TO INCLUDE TOOLING FOR THE MECHANISM ASSEMBLY TO ASSURE TOTAL CAPABILITY COMPLIANCE WITH THE 10,000 B.D.E. UNITS REQUIRED PER MONTH, AND AUTOMATIC INSERTION EQUIPMENT TO LOAD THE COMPONENTS ON THE P.C.B. SHOULD AN INCREASED RATE BECOME NECESSARY.

#### 4.4 DATA SUMMARY

AN ANALYSIS OF THE DATA INDICATES THAT THE FIXTURES AND TOOLING ARE CAPABLE OF PRODUCING M509A2E1 B.D.E. TO THE LATEST REVISION OF THE SPECIFICATION.

THE DATA INDICATES THAT THERE WERE SEVEN PROCESSES WHICH REQUIRED MULTIPLE EQUIPMENT AND OPERATORS.  
THESE PROCESSES WERE:

- A      INSTALLATION OF S2 CONTACT ASSEMBLY ON THE P.C.B. AT 36/HR.
- B      INSTALLATION OF ELECTRONIC COMPONENTS ON THE P.C.B. AT 20/HR.

- C TOUCH UP - P.C.B. AT 40/ HR.
- D PRELIMINARY ENCAPSULATION OF P.S. ASSEMBLY AT 5/
- E ENCAPSULATION OF P.S. AT 20/HR.
- F ATP AT 42/HR.
- G ATP TIMING AT 26/HR.

FROM THE RATES, WHICH WERE ESTABLISHED DURING THE DEMONSTRATION TESTING, WE ARE ABLE TO MAKE THE FOLLOW DETERMINATION FOR EACH OF THESE PROCESSES.

- A. ONE FIXTURE WAS ABLE TO MEET THE RATE OF 5,000 U PER MONTH. A SECOND FIXTURE OR A REDESIGN OF THE WIRE MOUNTING HOLDER ALLOWING THE UNIT TO BE WAVE SOLDERED WOULD MEET 63 UNITS PER HOUR RATE.
- B. ONE OPERATOR WAS ABLE TO MOUNT ALL THE COMPONENT ONTO THE P.C.B. AT A RATE OF 20 UNITS PER HOUR. INCREASE THE RATE TO 63 UNITS PER HOUR WILL REQUIRE (3) OPERATORS. AN ALTERNATIVE PROGRAM TO AUTOMATICALLY INSERT THE COMPONENTS WOULD REDUCE THE REQUIREMENT FOR (3) OPERATORS.
- C. TOUCHING UP THE P.C.B. AFTER WAVE SOLDERING WAS PERFORMED AT THE RATE OF 40 PER HOUR. OUR ANALYSIS INDICATES THAT THE TOUCH-UP WAS REQUIRED DUE TO DESIGN OF THE PRESENT P.C.B. WHICH HAS HOLE SIZES OPTIMIZED FOR HAND SOLDERING. WHEN THE P.C.B. DESIGN IS REVISED FOR WAVE SOLDERING THE RATE SHOULD INCREASE TO OVER 63 PER HOUR.
- D/E. TO PERFORM ENCAPSULATION OF THE POWER SUPPLY ASSEMBLY AT THE RATE OF 53 UNITS PER HOUR REQUIRES ADDITIONAL FIXTURES AND OPERATORS. AS AN ALTERNATIVE, WE RECOMMEND THAT A REVISED ENCAPSULATION TECHNIQUE BE EMPLOYED.

F. THE ACCEPTANCE TESTING OF THE COMPONENTS IS CONTROLLED AND THE RESULTS PRINTED OUT, BY A MODEL 85 H.P. COMPUTER. A COMPLETE PRINTOUT SLOWS THE TEST CYCLE. WE RECOMMEND THAT A PRINTOUT OF ACCEPT OR REJECT, WITHOUT COMPONENT PARAMETERS BE EMPLOYED, SPEEDING UP THE TEST CYCLE.

G. WE RECOMMEND THAT THE COMPUTER SOFTWARE PROGRAM USED ON THE H.P. MODEL 85 COMPUTER TO EVALUATE AND PROVIDE ACCEPT/REJECT TIMING CRITERIA BE REVISED TO PERFORM THE EVALUATION MORE RAPIDLY.

#### 4.5 DESCRIPTION OF EQUIPMENT

A LIST AND DESCRIPTION OF ALL EQUIPMENT USED TO MANUFACTURE AND TEST M509A2E1 B.D.E. UNITS IS AVAILABLE TO THE READER.

AN UP TO DATE LIST CAN BE FOUND IN THE APPENDIX OF THIS DOCUMENT.

#### 4.6 TEST PROCEDURES

THE FOLLOWING IS A LIST OF THE APPLICABLE TEST PROCEDURES WHICH HAVE BEEN ENCLOSED IN THE APPENDIX. IT SHOULD BE NOTED THAT THE PROCEDURES APPLICABLE TO THE S.B. GENERATOR WERE PREVIOUSLY SUPPLIED IN THE PHASE "A" DEMONSTRATION TEST REPORT DOCUMENT NUMBER 330-043-1. THE PROCEDURES REQUIRED FOR PHASE "B" HAVE BEEN ENCLOSED FOR INFORMATIONAL PURPOSES.

330-034

330-037

330-038

APPENDIX

85

**BULOVA**

SYSTEMS AND INSTRUMENTS CORPORATION  
VALLEY STREAM, N.Y. 11582

SHEET

330-043-2

REV.



APPENDIX K  
ACCEPTANCE TEST PROCEDURE  
FOR  
MOLDED HOUSING ASSEMBLY



BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:

UNITED STATES ARMY ARMAMENT  
R & D COMMAND

DOCUMENT NO.

330-034

DATE 12 SEPTEMBER 1983

PROGRAM M. M. & T. - M.P.S.  
M509A2E1 - B.D.E.

PURCHASE ORDER

PRIME CONTRACT  
DAAK10-80-C-0183

SUBJECT

ACCEPTANCE TEST PROCEDURE

COMPONENT TESTING

105 MM

MOLDED HOUSING ASSEMBLY: KD 90852

CDRL: A008

PREPARED BY: \_\_\_\_\_

Irwin Podbielak  
Reliability Engineer

APPROVED BY: \_\_\_\_\_

A. Koul  
Quality Control Manager

APPROVED BY: \_\_\_\_\_

B.J.Garfinkel  
Director of Quality

APPROVED BY: \_\_\_\_\_

M. Moskowitz  
Proj. Mgr. M. M. & T.

APPROVED BY: \_\_\_\_\_

S. B. Schulman  
Mgr. Special Svcs. Dept.

E  
D  
C  
B  
A

DATE APVL 1 2 3 4 5 6 7 8 9 10 11 90

14 15 16 17 18 19 21 22 23 24 25 26 27 28 29

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-034

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## 1.0 SCOPE

- 1.1 THIS DOCUMENT HAS BEEN PREPARED BY BULOVA SYSTEMS & INSTRUMENTS CORPORATION (BSIC) IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT NO. DAAK10-80-C-0183 FOR THE 105MM BASE ELEMENT AND IS IN COMPLIANCE WITH THE REQUIREMENTS OF CDR Item: A008.
- 1.2 ALL 105MM MOLDED HOUSING ASSEMBLIES SHALL BE SUBJECTED TO AND PASS THE COMPONENT TEST PROCEDURE IN ACCORDANCE WITH THIS DOCUMENT.
- 1.3 THE COMPUTER PRINT-OUT DATA SHEET SHALL BE SERIALIZED AND SIGNED BY THE PERSONNEL PERFORMING THE TEST. THE DATA SHEET SHALL ACCOMPANY THE HARDWARE AS IT PROGRESSES THROUGH THE MANUFACTURING AND TEST PROCESS.

## 2.0 APPLICABLE DOCUMENTS

- 2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT. IN CASE OF CONFLICT THIS DOCUMENT SHALL GOVERN.

### MILITARY

DAAK10-80-C-0183

CONTRACT ARRADCOM, 105MM, B.E.

### BSIC

273-60005

TEST CONSOLE, COMPONENT

## 3.0 EQUIPMENT

273-60005

TEST, CONSOLE, COMPONENT

85

H.P. COMPUTER

**4.0 GENERAL**

**4.1 THIS DOCUMENT DEFINES THE OPERATION OF AN AUTOMATED COMPUTER CONTROLLED TEST SET.**

**5.0 TEST/START-UP**

**5.1 ACTIVATE POWER SWITCH ON CONSOLE 273-60005 TO "ON".**

**5.2 ACTIVATE POWER SWITCH ON MODEL H.P. 85 COMPUTER TO "ON". THE COMPUTER WILL AUTOMATICALLY LOAD.**

**5.3 COMPUTER SCREEN SHALL INDICATE "SELECT PROGRAM TO BE LOADED", MESSAGE. ACTIVATE COMPUTER "K1" KEY BELOW "M509" MESSAGE.**

**5.4 WAIT UNTIL "ENTER DATE" MESSAGE APPEARS.**

**5.5 ENTER DATE OF TEST INTO COMPUTER USING THE FOLLOWING FORMAT. (EXAMPLE-JULY 4, 1983 WOULD BE ENTERED INTO THE COMPUTER AS 07/04/83).**

**5.6 ACTIVATE "END LINE" KEY ON COMPUTER. "ENTER TIME" MESSAGE APPEARS.**

**5.7 ENTER TIME OF TEST INTO COMPUTER USING THE FOLLOWING FORMAT. (EXAMPLE - 10.37) ACTIVATE "END LINE" KEY.**

**5.8 THE MESSAGE ON THE COMPUTER NOW INDICATES "SELECT ONE", "PRINT RUN" OR "STRAIGHT RUN".**

**5.9 ACTIVATE "K1" KEY ON COMPUTER BELOW "PRINT RUN" MESSAGE. COMPUTER MESSAGE NOW ASKS "WHAT TEST TO BEGIN?"**

**5.10 ACTIVATE NUMBER # (1) KEY ON COMPUTER.**

- 5.11 ACTIVATE "AUTO/MANUAL" SWITCH ON CONSOLE TO "AUTO".
- 5.12 ACTIVATE "END LINE" KEY ON COMPUTER.
- 5.13 INSTALL NEXT UNIT UNDER TEST INTO FIXTURE POSITION IN ACCORDANCE WITH COMPUTER DISPLAY MESSAGE (STATION #1 OR STATION #2). INSTALL UNIT UNDER TEST BY PUSHING FIXTURE KNOB FORWARD AND ROTATING THE KNOB CLOCKWISE TO LOCK UNIT UNDER TEST INTO TEST POSITION.
- 5.14 WAIT FOR PRINT-OUT OF TEST.
- 5.15 UNLOAD UNIT UNDER TEST BY ROTATING TEST FIXTURE LEVER COUNTERCLOCKWISE AND LOAD NEXT UNIT IN ACCORDANCE WITH COMPUTER MESSAGE DIRECTION.
- 5.16 WRITE-IN SERIAL NUMBER OF UNIT UNDER TEST IN APPROPRIATE LOCATION ON PRINT-OUT SHEET (SAMPLE PRINT-OUT - TABLE -1).
- 5.17 ACCEPT OR REJECT M509A2E1 COMPONENT TEST UNITS BASED ON THE PRINT-OUT PARAMETERS AND COMPUTER DECISION INFORMATION. THE DATA PRINTOUT INDICATES PARAMETER LIMITS AND COMPONENT TEST VALUE.

APPENDIX

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**BULOVA** SYSTEMS AND INSTRUMENTS CORPORATION  
VALLEY STREAM, N.Y. 11582

SHEET

330-034

REV.

M609 A2E1 BDE DATA SHEET

DATE 09 26 83

TIME 9:05

SERIAL NO

1 F + R1 (C1)

MIN = 460 MOHMS

MAX = 800 MOHMS

ACTUAL= 5902.1 MOHMS

\*\*\* ABOVE MAXIMUM VALUE \*\*\*

CONT : C1

MIN = 30 KOHMS

MAX = 114 KOHMS

ACTUAL= 102.13 KOHMS

WITHIN SPEC

CONT : D1 (FWD)

MIN = 250 OHMS

MAX = 730 OHMS

ACTUAL= 348.82 OHMS

WITHIN SPEC

CONT : D1 (REV)

MIN = 4000 MOHMS

MAX = 9999 MOHMS

ACTUAL= 5711.6 MOHMS

WITHIN SPEC

CONT : L1

MIN = 40 OHMS

MAX = 50 OHMS

ACTUAL= 41.897 OHMS

WITHIN SPEC

XELD : L1@3000GHz

CAP : C1

MIN = .5 MFD

MAX = .7 MFD

ACTUAL= .57009 MFD

WITHIN SPEC

CONT : CONTACT)

MIN = 0 OHMS

MAX = 1 OHMS

ACTUAL= 035801 OHMS

WITHIN SPEC

--TEST 1 ABOVE SPEC

TATTE - 1

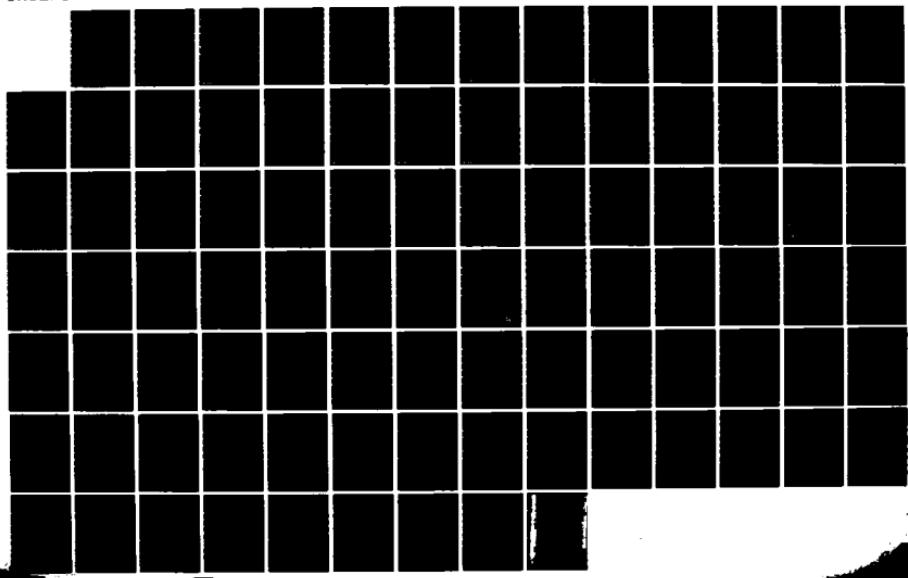
AD-A142 816 MAGNETIC POWER SUPPLY ASSEMBLY OF M509A2E1 FUZE(U) 2/2  
BULOVA SYSTEMS AND INSTRUMENTS CORP ALLEY STREAM N Y  
M MOSKOWITZ MAY 84 338-044 ARLCD-CR-83047

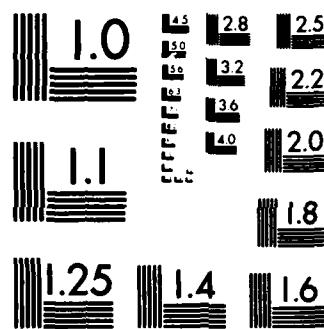
UNCLASSIFIED

DAAK10-80-C-0183

F/G 19/1

NL





MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

```

5 01=4
10 DIM A(12),L(12),H(12),W(12),
F(12),T$(12)
20 DIM A$(40)
30 SHORT L,H,A
40 A$="-----"
50 CLEAR
60 DISP "ENTER DATE (MM/DD/YY)" : INPUT D$
65 IF TIME > 5000 THEN 90
70 DISP "ENTER TIME(H MM)" : IN
PUT T
80 SETTIME INT(T)*3600+FP(T)*10
90 REM *** INITIALIZE ARPAYS ***
100 FOR N=1 TO 12
110 READ W(N)
120 NEXT N
130 FOR X=1 TO 12
140 READ H(X)
150 NEXT X
160 FOR X=1 TO 12
170 READ M(X)
180 NEXT X
190 CONTROL 4.4 : 204
200 CLEAR
210 DISP @ DISP @ DISP @ DISP "
SELECT ONE"
220 P=0 @ ON KEY# 1, "PR.PUN" GOT
0 260
230 ON KEY# 2, "PUN EM" GOTO 270
240 KEY LABEL
250 GOTO 220
260 P=1
270 CLEAR
280 DISP "WHAT TEST TO BEGIN":@ INPUT N
290 REM **** WAIT FOR START ****
300 CLEAR
310 DISP @ DISP @ DISP @ DISP @
DISP " PRESS START"
320 ENTER 410 USING "#.W" : Z1
330 IF BIT(Z1,5)=1 THEN 320
340 CLEAR
350 DISP @ DISP @ DISP @ DISP
360 IF 01=4 THEN DISP " IN
SERT UNIT #2"
365 IF 01=0 THEN DISP " IN
SEPT UNIT #1"
370 ENTER 410 USING "#.W" : Z1
380 IF 01=0 AND BIT(Z1,6)=0 AND
BIT(Z1,7)=1 THEN 01=4 @ GOTO
450
390 IF 01=4 AND BIT(Z1,6)=1 AND
BIT(Z1,7)=0 THEN 01=0 @ GOTO
450
400 IF BIT(Z1,6)=0 AND BIT(Z1,7)
=0 THEN GOTO 420

```

```

410 GOTO 440
420 IF 01=4 THEN CLEAR @ DISP "
REMOVE UNIT #1"
422 IF 01=0 THEN CLEAR @ DISP "
REMOVE UNIT #3"
425 ENTER 410 USING "#.W" : Z1
430 IF BIT(Z1,6)=0 AND BIT(Z1,7)
=0 THEN GOTO 425
440 GOTO 370
450 CLEAR
460 FOR X=1 TO 12 @ F(X)=0 @ NEW
T X @ F=0
470 REM **** HOME TI PPG  ****
480 OUTPUT 410 USING "#.W" : Z40
1 @ WAIT 100 @ OUTPUT 410 US
ING "#.W" : Z40
490 REM **** WAIT FOR HOME ****
500 ENTER 410 USING "#.W" : Z1
510 IF BIT(Z1,8)=0 THEN 430
520 REM *** MAIN TEST LOOP ***
530 FOR X=N TO 12
540 REM ***STEP TI TO NEXT TEST*
**
550 OUTPUT 410 USING "#.W" : Z40
1 @ WAIT 20 @ OUTPUT 410 USI
NG "#.W" : Z40
560 REM *** CHECK TEST NUMBER ***
*
570 ENTER 410 USING "#.W" : X1
580 Z1=BINAND(X1,15)
590 IF Z1>9 THEN 10
600 T=10*X1+X1+Z1
610 IF T=0 THEN 750
620 IF T>X AND T<=12 THEN 550
630 IF T>X AND T>12 THEN 430
640 REM *** GET BCD FROM DUM ***
**
650 WAIT W(X)
660 ENTER 3 : Z,1
670 IF Z>199999 THEN DISP "OVERF
LOW" @ GOTO 10
680 IF Y=7 THEN Z=Z* 01
690 IF Y=6 THEN Z=Z* 001
700 IF Y=5 THEN Z=Z* 0001
710 IF Y=4 THEN Z=Z* 00001
720 IF Y=3 THEN Z=Z* 000001
730 A(X)=Z
740 NEXT X
750 REM ** PRINT OUT **
760 X=0
770 IF P>1 THEN 900
780 PRINT "M505 A2E1 BDE DATA SH
EET"
790 PRINT "DATE ":D$
800 T=TIME
810 T1=INT(TIME/3600)
820 T2=INT((T-T1*3600)/60)
830 IF T2>9 THEN T$=VAL$(T1)&"."&
VAL$(T2)
840 IF T2<10 THEN T$=VAL$(T1)&"0"&
VAL$(T2)

```

TABLE - 20" & VAL\$(T2)

### PROGRAM

```

850 PRINT "TIME ", TS
860 PRINT "SERIAL NO."
870 PRINT AS
880 PRINT AS
890 PRINT "I.E.(R2||C1)"
900 GOSUB 1200
910 IF P=0 THEN 930
920 PRINT "I.P.(OPEN)"
930 GOSUB 1200
940 IF P=0 THEN 960
950 PRINT "CONT.(R1)"
960 GOSUB 1200
970 IF P=0 THEN 990
980 PRINT "CONT(D1/FWD)"
990 GOSUB 1200
1000 IF P=0 THEN 1020
1010 PRINT "CONT.(D1/REV)"
1020 GOSUB 1200
1030 IF P=0 THEN 1050
1040 PRINT "CONT(L1)"
1050 GOSUB 1200
1060 IF P=0 THEN 1080
1070 PRINT "XELI(L1@2000Hz)"
1080 GOSUB 1200
1090 IF P=0 THEN 1110
1100 PPINT "CAP(C1)"
1110 GOSUB 1200
1120 IF P=0 THEN 1140
1130 PRINT "CONT(CONTACT)"
1140 GOSUB 1200
1150 GOSUB 1360
1160 GOTO 300
1170 DATA 12000,3000,3000,300E,6
     000,3000,0,3000,3000,0,0,0
1180 DATA 460000000,90000,90000,
     250,400000000,40,0,.5,0,0,
     0,0
1190 DATA 820000000,820000000,11
     4000,730,9.9E105,50,0,.7,.1
     ,0,0,0
1200 X=X+1
1210 IF W(X)=0 THEN 1330
1215 GOSUB 1480
1220 IF P=0 THEN 1300
1240 PRINT "MIN =",L;TS
1250 PRINT "MAX =",H;TS
1260 PPINT "ACTUAL =",A;TS
1270 IF A>=L AND A<=H THEN PRINT
     " WITHIN SPEC"
1280 IF A<L THEN PRINT "**** BELOW
     MINIMUM VALUE ***" @ F(X)
     )=-1
1290 IF A>H THEN PRINT "**** ABOVE
     MAXIMUM VALUE ***" @ F(X)
     )=1
1300 IF A<L THEN F(X)=-1
1310 IF A>H THEN F(X)=1
1320 IF P=0 THEN 1350
1330 PRINT AS
1340 PRINT AS
1350 RETURN
1360 CLEAR
1370 FOR N=1 TO 12
1380 IF F(X)=0 THEN 1410
1390 IF F(X)>0 THEN PRINT "-TEST
     " ; X; " ABOVE SPEC" @ F=1
1400 IF F(X)<0 THEN PRINT "-TEST
     " ; X; " BELOW SPEC" @ F=1
1410 NEXT X
1420 PPINT @ PRINT @ PRINT @ PPI
     NT & PRINT
1430 IF F<0 THEN 1470
1440 DISP @ DISF @ DISF @ DISF
     @ DISP " *****"
1450 DISP " ***** GOOD UNIT
     ****"
1460 WAIT 5000
1470 RETURN
1480 ON X GOTO 1500,1500,1550,16
     00,1500,1700,1750,1800,1850
1490 STOP
1500 L=L(X)/10^6
1510 H=H(X)/10^6
1520 A=(200/A(X)-11)*10^-1
1530 TS="MOHMS"
1540 RETURN
1550 L=L(X)/1000
1560 H=H(X)/1000
1570 A=A(X)*1000000/1000
1580 TS="KOHMS"
1590 RETURN
1600 L=L(X)
1610 H=H(X)
1620 A=200000/A(X)-10100
1630 IF L<0 THEN L=0
1640 TS="OHMS"
1650 IF L>10^5 THEN 1670
1660 GOTO 1690
1670 L=L/10^6 @ H=H/10^6 @ A=A/1
     0^6
1680 TS="MOHMS"
1690 RETURN
1700 L=L(X)
1710 H=H(X)
1720 A=A(X)*9900
1730 TS="OHMS"
1740 RETURN
1750 L=L(X)
1760 H=H(X)
1770 A=10000*A(X)/(1-A(X))/4*PI
1780 TS="MHZ"
1790 RETURN
1800 L=L(X)
1810 H=H(X)
1820 A=A(X)*10
1830 TS="MFD"
1840 RETURN
1850 L=L(X)
1860 H=H(X)

```

TABLE - 2  
 1870 A=2000\*A(X)/(20-A(X))  
 1880 TS="OHMS"  
 PJ 98 'AM 1890 RETURN

APPENDIX L  
ACCEPTANCE TEST PROCEDURE  
FOR  
COIL ASSEMBLY



BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:

UNITED STATES ARMY ARMAMENT  
R & D COMMAND

DOCUMENT NO.  
330-037

DATE 16 JUNE 1983

PROGRAM M. M. & T. - M. P. S.  
M509A2E1 B. D. E.

PURCHASE ORDER

PRIME CONTRACT  
DAAK10-80-C-0183

SUBJECT

ACCEPTANCE TEST PROCEDURE

COIL ASSEMBLY - KC90829

PREPARED BY: \_\_\_\_\_

Irwin Podbielak  
Reliability Engineer

APPROVED BY: \_\_\_\_\_

A. Koul  
Quality Control Manager

APPROVED BY: \_\_\_\_\_

B. Garfinkel  
Director of Quality

APPROVED BY: \_\_\_\_\_

M. Moskowitz  
Proj. Mgr. M. M. & T.

APPROVED BY: \_\_\_\_\_

S. B. Schulman  
Mgr. Special Devices Dept.

E  
D  
C  
B  
A

MATL APRIL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 25 26 27 28 29

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SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-037

## **1.0 SCOPE**

**1.1 THIS DOCUMENT DEFINES THE BSIC ACCEPTANCE TEST PROCEDURE WHICH SHALL BE ADHERED TO WHEN VERIFYING THE CONTINUITY AND RESISTANCE OF THE COIL ASSEMBLY - KC90829.**

## **2.0 APPLICABLE DOCUMENTS**

**2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENTS, THIS DOCUMENT SHALL GOVERN.**

### **BSIC**

KC90829	COIL ASSEMBLY
273-60004	COIL ASSEMBLY, CONTINUITY FIXTURE

## **3.0 REQUIREMENTS**

### **3.1 MATERIAL**

KC90829	COIL ASSEMBLY
---------	---------------

### **3.2 EQUIPMENT**

273-60004	COIL ASSEMBLY, CONTINUITY FIXTURE
	MULTIMETER, SIMPSON MODEL 269

## **4.0 PROCEDURE**

**4.1 SET RANGE SELECTOR SWITCH ON MULTIMETER TO R-X-1 POSITION.**

**4.2 SHORT LEADS OF MULTIMETER TOGETHER AND ADJUST ZERO OHMS KNOB UNTIL METER INDICATES ZERO OHMS.**

**4.3 CONNECT LEADS OF MULTIMETER TO TERMINALS ON CONTINUITY TEST FIXTURE 273-60004.**

4.4 PLUG COIL ASSEMBLY UNDER TEST INTO CONTINUITY TEST FIXTURE.

4.5 MULTIMETER SHOULD INDICATE CONTINUITY BETWEEN 40 and 50 OHMS, DIRECT READING SINCE MULTIMETER IS ON R-X-1 SCALE.

5.0 QUALITY ASSURANCE

5.1 INSPECTION PERSONNEL SHALL VERIFY THAT THE MULTIMETER USED IS WITHIN CALIBRATION PERIOD.

5.2 INSPECTION PERSONNEL SHALL VERIFY CONTINUITY IN ACCORDANCE WITH DRAWING REQUIREMENTS.

APPENDIX M  
ACCEPTANCE TEST PROCEDURE  
FOR  
ARMING TIME TEST



BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

TO:	DOCUMENT NO.	A
UNITED STATES ARMY ARMAMENT R & D COMMAND	330-038	
	DATE 15 AUGUST 1983	
	PROGRAM M. M. & T. - M. P. S. M509A2E1 - B. D. E.	
	PURCHASE ORDER	
	PRIME CONTRACT	
	DAAK10-80-C-0183	

SUBJECT

ACCEPTANCE TEST PROCEDURE

ARMING TIME TEST

105MM HOUSING AND MECHANISM ASSY: KF90853

PREPARED BY: \_\_\_\_\_

Irwin Podbielak  
Reliability Engineer

APPROVED BY: \_\_\_\_\_

A. Koul  
Quality Control Manager

APPROVED BY: \_\_\_\_\_

B. Garfinkel  
Director of Quality

APPROVED BY: \_\_\_\_\_

M. Moskowitz  
Proj. Mgr. M. M. & T.

APPROVED BY: \_\_\_\_\_

S. B. Schulman  
Mgr. Special Devices Dept.

E  
D  
C  
B

A A A A A A A A A A A A A A A A A A

DATE APRIL 1 2 3 4 5 6 7 8 9 10 11 12 108 15 16 17 18 19 21 22 23 24 25 26 27 28 29

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

SHEET

330-038

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WARNING

THESE UNITS CONTAIN LIVE DETONATORS AND MUST BE HANDLED WITH EXTREME CARE IN ACCORDANCE WITH BSIC HAZARDOUS MATERIAL PROCEDURES. SAFETY GLASSES MUST BE WORN BY ALL PERSONNEL IN THE AREA AND GROUNDING STRAP MUST BE WORN BY THE TEST OPERATOR.

UNITS MUST BE TRANSPORTED ONLY IN PORTABLE MAGAZINES (RED BOXES) WITH A MAXIMUM OF ONE LAYER USED PER MAGAZINE.

ALL TEST EQUIPMENT AND FIXTURES USED MUST BE APPROVED FOR USE BY THE SAFETY ENGINEER AND THE DESIGNATED PROJECT ENGINEER.

110

**WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR**

**1.0 SCOPE**

THIS DOCUMENT HAS BEEN PREPARED BY BULOVA SYSTEMS AND INSTRUMENTS CORPORATION (BSIC) IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT NO. DAAK10-80-C-0183 FOR THE 105MM BASE ELEMENT AND IS IN COMPLIANCE WITH THE REQUIREMENTS OF CDRL ITEM: A008

- 1.1 ALL 105MM BASE ELEMENTS SHALL BE SUBJECTED TO AND PASS THE FINAL TEST PROCEDURE IN ACCORDANCE WITH THIS DOCUMENT.
- 1.2 THE DATA SHEET WHICH SHALL BE COMPLETED, SERIALIZED, AND SIGNED BY THE PERSONNEL PERFORMING THE TEST, SHALL BE THE COMPUTER PRINT-OUT SHEET ATTACHED TO THIS DOCUMENT. THE DATA SHEET SHALL ACCOMPANY THE HARDWARE AS IT PROGRESSES THROUGH THE MANUFACTURING AND TEST PROCESS.

**2.0 APPLICABLE DOCUMENTS**

THE FOLLOWING DOCUMENTS, OF THE ISSUED IN EFFECT ON THE DATE OF REQUEST FOR PROPOSAL, FORM A PART OF THIS DOCUMENT.

**MILITARY**

DAAK10-80-C-0183      CONTRACT ARRADCOM 105MM B.E.

**3.0 EQUIPMENT REQUIRED**

358-19012	ROTOR ADJUSTMENT TOOL
L1-4091	CENTRIFUGE
236-60007	CENTRIFUGE TEST CONSOLE
236-60007-13	CENTRIFUGE HOLDING FIXTURE
MODEL 290	NICOLET OSCILLOSCOPE
MODEL 206	NICOLET PLUG-IN AMPLIFIER
331-60001	ARMING TIME TEST CONSOLE

**WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR**

**4.0 GENERAL**

4.1 ALL 105MM HOUSING & MECHANISM, BASE ELEMENTS SHALL BE SUBJECTED TO AND PASS THE ACCEPTANCE TESTS LISTED HEREIN.

A) ACCEPTANCE TEST PROCEDURE, HOUSING MECHANISM ASSY  
330-038

4.2 THE DATA SHEET WHICH SHALL BE COMPLETE, SERIALIZED, AND SIGNED BY THE PERSONNEL PERFORMING THE SPECIFIC TEST, SHALL BE THE COMPUTER PRINT-OUT SHEET. THE DATA SHEET SHALL ACCOMPANY THE HARDWARE TESTED AS IT PROGRESSES THROUGH THE MANUFACTURING AND TEST PROCESS. THE DATA SHEET SHALL ACT AS A TRAVELER AND INDICATE THE STATUS OF THE HARDWARE.

4.3 THIS TEST MAKES USE OF A PROGRAMMED HP-85 COMPUTER TO EVALUATE THE CURVE TRACE AND ARMING TIME OF FROM (1) TO (4) HOUSING AND MECHANISM ASSEMBLIES (H.M.A.) SIMULTANEOUSLY. THE ACCEPT/REJECT CRITERIA ARE ANALYZED BY THE COMPUTER WHICH PROVIDES A PRINT-OUT FOR EACH OF THE (4) STATIONS, PROVIDING A HIGH SPEED THROUGH PUT OF THE UNITS UNDER TEST. THE OPERATOR IS ONLY REQUIRED TO WRITE IN THE APPLICABLE SERIAL NUMBER, DATE AND SIGNATURE. ALL REJECTED UNITS SHALL BE SEGREGATED AND DISPOSITIONED BY AN INSPECTION SUPERVISOR.

**5.0 TESTING**

5.1 COMPONENT TEST - EVERY 105MM HOUSING MOLDED ASSEMBLY BSIC P/N KD90852-1 SHALL BE TESTED IN ACCORDANCE WITH REL-330-008-2.

**WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR**

**5.2      DETONATOR TEST**

**OPERATOR WARNING**

**WEAR GROUND STRAP AND SAFETY GLASSES**

5.2.1 ALL UNITS TO BE ARM TIME TESTED SHALL BE HANDLED AND TRANSPORTED IN THE SECOND SAFETY LOCK POSITION I.E.: THE ROTOR TRAP PIN SHALL BE ENGAGED WITH THE DRAG SENSOR PIN MAINTAINING A LOCKED POSITION APPROXIMATELY 51 DEGREES BEFORE THE ARM POSITION.

5.2.2 THE H.M.A. (S) SHALL BE SUBJECTED TO APPROXIMATELY 15 G'S (213 TO 219 RPM ) ON THE CENTRIFUGE TO ASSURE THAT THE BASE ELEMENT ARMS WITHIN THE PRESCRIBED ENVIRONMENT.

5.2.3 TURN THE COMPUTER POWER SWITCH ON. (BACK OF COMPUTER. SEE FIGURE-4). VERIFY THAT THE PROGRAM TAPE IS INSTALLED. WAIT FOR THE COMPUTER SCREEN TO PROVIDE INSTRUCTIONS. THEN SET THE OPERATION TO AUTOMATIC BY TYPING IN THE LETTER "A" AND THEN THE "END-LINE" KEY.  
ACTIVATE THE POWER ON SWITCH UNDER THE ARMING TIME TEST CONSOLE SHELF (ATTC). ACTIVATE THE POWER ON SWITCH ON THE LEFT SIDE OF CENTRIFUGE TIMER CONSOLE. (CTC) - (FIGURE-5)

ACTIVATE THE LATCH RELEASE SWITCH ON THE FRONT OF THE CENTRIFUGE. UNLATCH AND RAISE CENTRIFUGE COVER.

5.2.4 USING EXTREME CARE INSTALL THE H.M.A. (S) (AN EVEN QUANTITY UP TO (4) UNITS OR DUMMIES SHALL BE INSTALLED TO MAINTAIN BALANCE ON CENTRIFUGE ARMS) INTO THE CENTRIFUGE HOLDING FIXTURE, WHILE THE LOAD-SAFE KNOB IS IN THE LOAD POSITION ALLOWING THE H.M.A. TO SEAT. CONNECT THE CENTRIFUGE HOLDING FIXTURE, (CHF) CONNECTOR TO THE HOLDING FIXTURE.

**WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR**

ENGAGE THE ROTOR ADJUSTMENT TOOL INTO THE ROTOR SHAFT SLOT.

CAUTION: CARE SHALL BE EXERCISED TO PREVENT SLIPPING OF THE TOOL CAUSING ROTOR TO SPIN WHICH IN TURN MAY DAMAGE THE DRAG SENSOR SLOT.

ROTATE THE ROTOR ADJUSTMENT TOOL COUNTER CLOCKWISE (CCW).

HOLDING THE ROTOR ADJUSTMENT TOOL IN THIS POSITION GENTLY PRESS PLASTIC KNOB DOWN AND TURN IT CLOCKWISE (CW) UNTIL IT LOCKS IN THE SLOT. REMOVE THE ROTOR ADJUSTMENT TOOL. THE ROTOR IS NOW LOCKED IN THE SAFE POSITION (S2a).

5.2.5 NOTE: IF THE FIXTURE DID NOT ENGAGE PROPERLY AND ALLOWED THE ROTOR TO RETURN TO THE SECOND SAFETY POSITION STEP 5.2.4 CAN BE REPEATED WITH NO DAMAGE TO THE HOUSING AND MECHANISM ASSEMBLY.

5.2.6 CLOSE AND LATCH CENTRIFUGE DOOR.

ACTIVATE CTC START SWITCH. SPIN CENTRIFUGE AT 15 G'S (213 TO 219 RPM). ALLOW CENTRIFUGE TO STABILIZE AT 15 G'S. ACTIVATE "TEST ALL" SWITCH ON THE ARMING TIME TEST CONSOLE (ATTC). COMPUTER PRINT-OUT SHALL INDICATE TIMING OBTAINED ON ALL FOUR UNITS UNDER TEST. THE INDICATION SHALL BE ACCEPT OR REJECT.

THE ARMING TIME IS ALSO AVAILABLE FOR CORROBORATION ON THE OSCILLOSCOPE. THE TIMING SHALL BE GREATER THAN 10 AND LESS THAN 18 MILLISECONDS. THE WAVESHAPES SHALL BE EQUIVALENT TO FIGURE-1.

NOTE: ONLY THE COMPUTER PRINT-OUT IS REQUIRED.

**WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR**

THE TIMING SHALL CONSIST OF TWO (2) TRACES, S2 AND S3. TIMING STOP PULSE (S-3) OCCURS AFTER S3 HAS CLOSED. THE S3 TRACE SHALL PROVIDE EVIDENCE OF PROPER CLOSURE AND A SIGNAL LEVEL CHANGE SHALL BE EVIDENT.

5.2.7 ACTIVATE THE PLUG STOP SWITCH ON THE CTC. DO NOT REMOVE H.M.A. FROM THE CHF. USE EXTREME CAUTION AT THIS POINT AS THE DETONATOR IS NOW IN THE ARMED POSITION AND IS MOST DANGEROUS.

5.3 SAFE RESET (REPEAT FOR EACH UNIT)

5.3.1 WITH THE H.M.A. MAINTAINED IN THE CENTRIFUGE HOLDING FIXTURE AND THE CENTRIFUGE COMPLETELY STOPPED (RPM DIAL IS ZERO), RESET THE ROTOR TO THE SECOND SAFETY POSITION BY; ROTATING THE LOAD-SAFE LEVER TO THE SAFE POSITION LIFTING THE DRAG WEIGHT OUT OF ITS LOWEST POSITION.

5.3.2 USING THE ROTOR ADJUSTMENT TOOL, ROTATE THE ROTOR SHAFT (CCW) COUNTERCLOCKWISE FOR APPROXIMATELY 90 DEGREES. WHILE HOLDING THE ROTOR IN THIS POSITION, ROTATE THE LEVER, TO LOAD POSITION. SLOWLY ALLOW THE TOOL AND ROTOR TO TURN CW. WHEN UNIT STOPS - REMOVE TOOL.

5.3.3 UNIT IS NOW IN THE SECOND SAFETY POSITION. RECORD SERIAL NUMBER(S) AND SIGN PRINT -OUT SHEET IN THE APPROPRIATE AREA.

5.3.4 CONTINUING TO USE EXTREME CAUTION AND FOLLOWING THE PROCEDURES PRESCRIBED IN THE WARNING ON SHEET 4, REMOVE THE H.M.A. UNDER TEST FROM THE CENTRIFUGE HOLDING FIXTURE:

1. REMOVE THE CENTRIFUGE HOLDING FIXTURE CONNECTOR.

**WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR**

**5.3.5 THE ARMING TIME TEST CONSOLE SHALL HAVE AUTOMATICALLY  
RECYCLED TO HOME AND SHALL BE READY TO EVALUATE THE NEXT  
SET OF H.M.A(S).**

**6.0 QUALITY CONTROL**

**6.1 THE INSPECTOR SHALL VERIFY THAT CALIBRATION OF ALL  
EQUIPMENT REQUIRED TO PERFORM THIS TESTING IS UP TO DATE.**

**6.2 ALL UNITS TESTED WHICH INDICATE REJECT ON THE COMPUTER  
PRINT-OUT SHALL BE SEGREGATED FOR DISPOSITION.**

**APPENDIX**

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**BULOVA / SYSTEMS AND INSTRUMENTS CORPORATION**  
VALLEY STREAM, N.Y. 11582

SHEET

330-038

REV.  
A

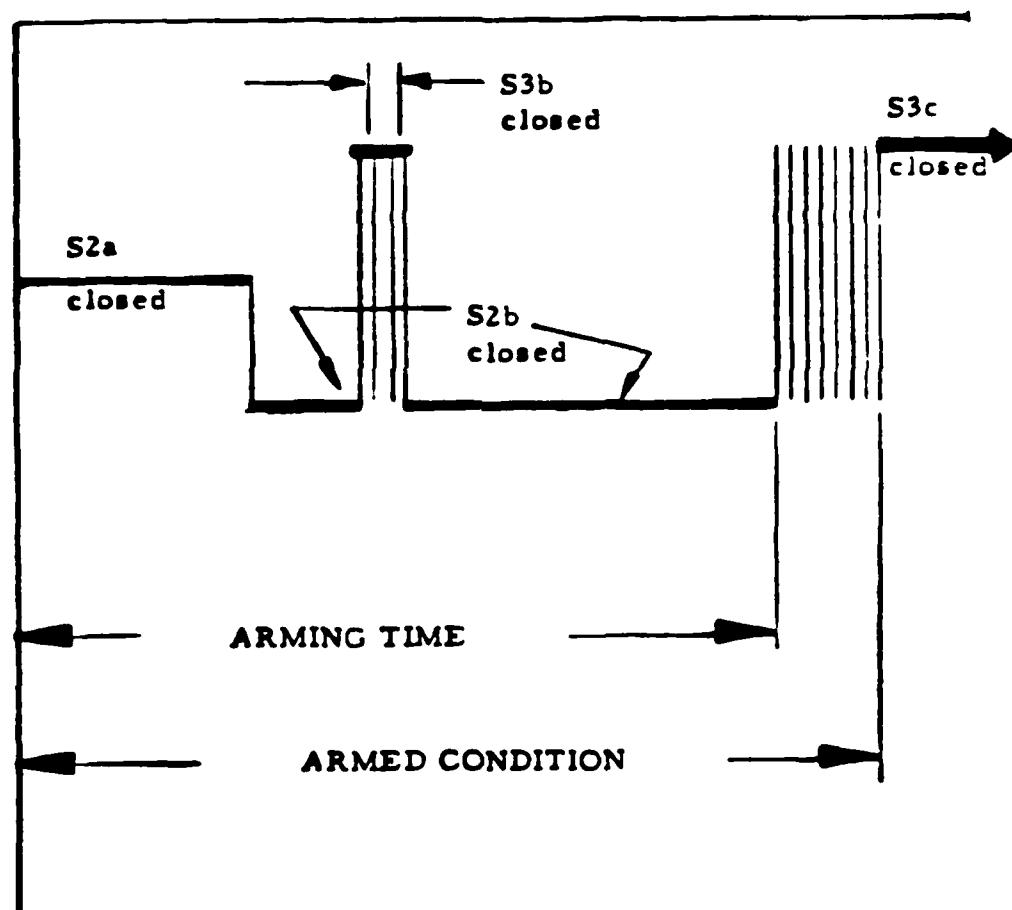


FIG. 1    VIEW OF NICOLET OSCILLOSCOPE TRACE  
          FOR AN ACCEPTABLE TEST.

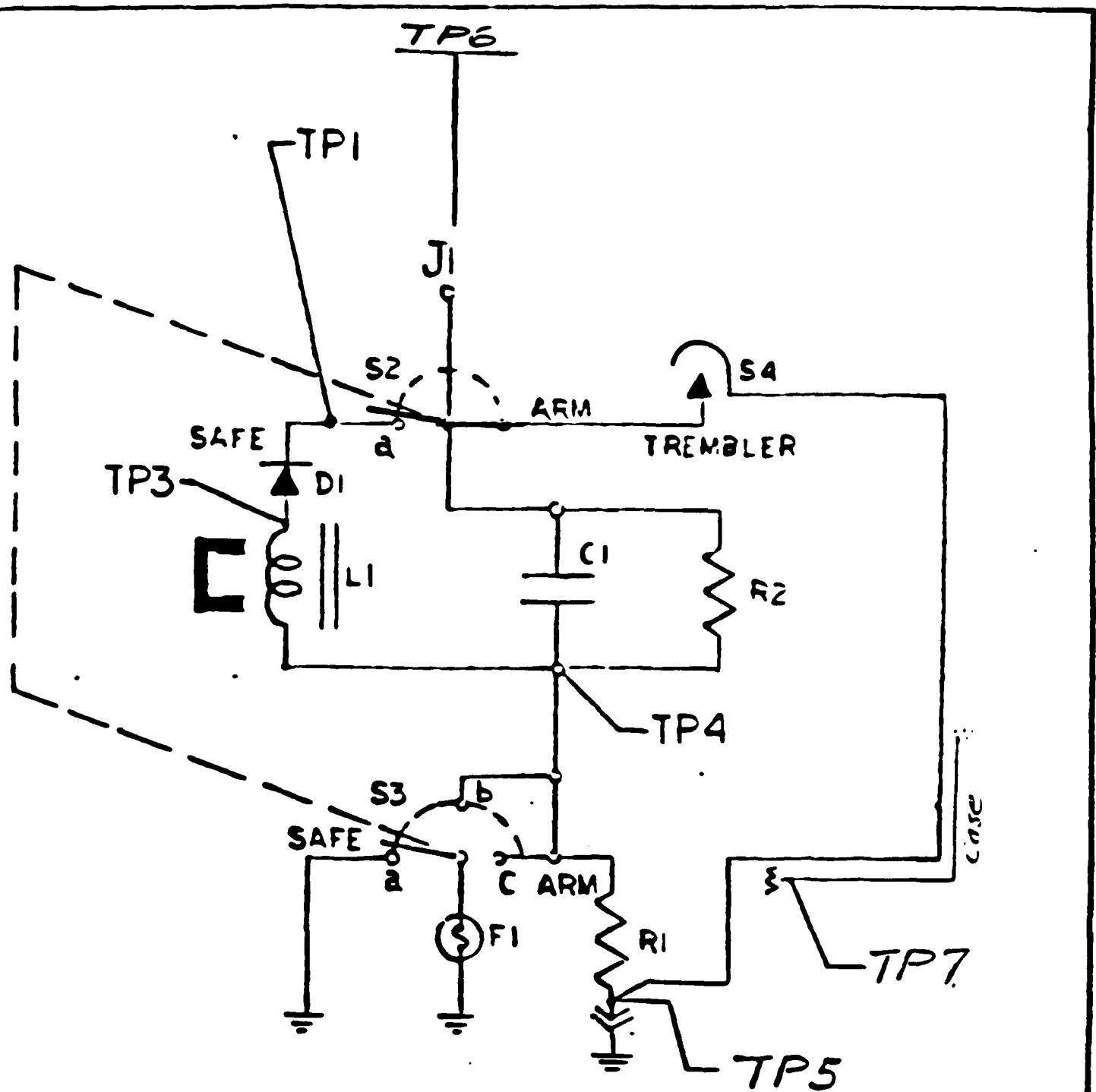
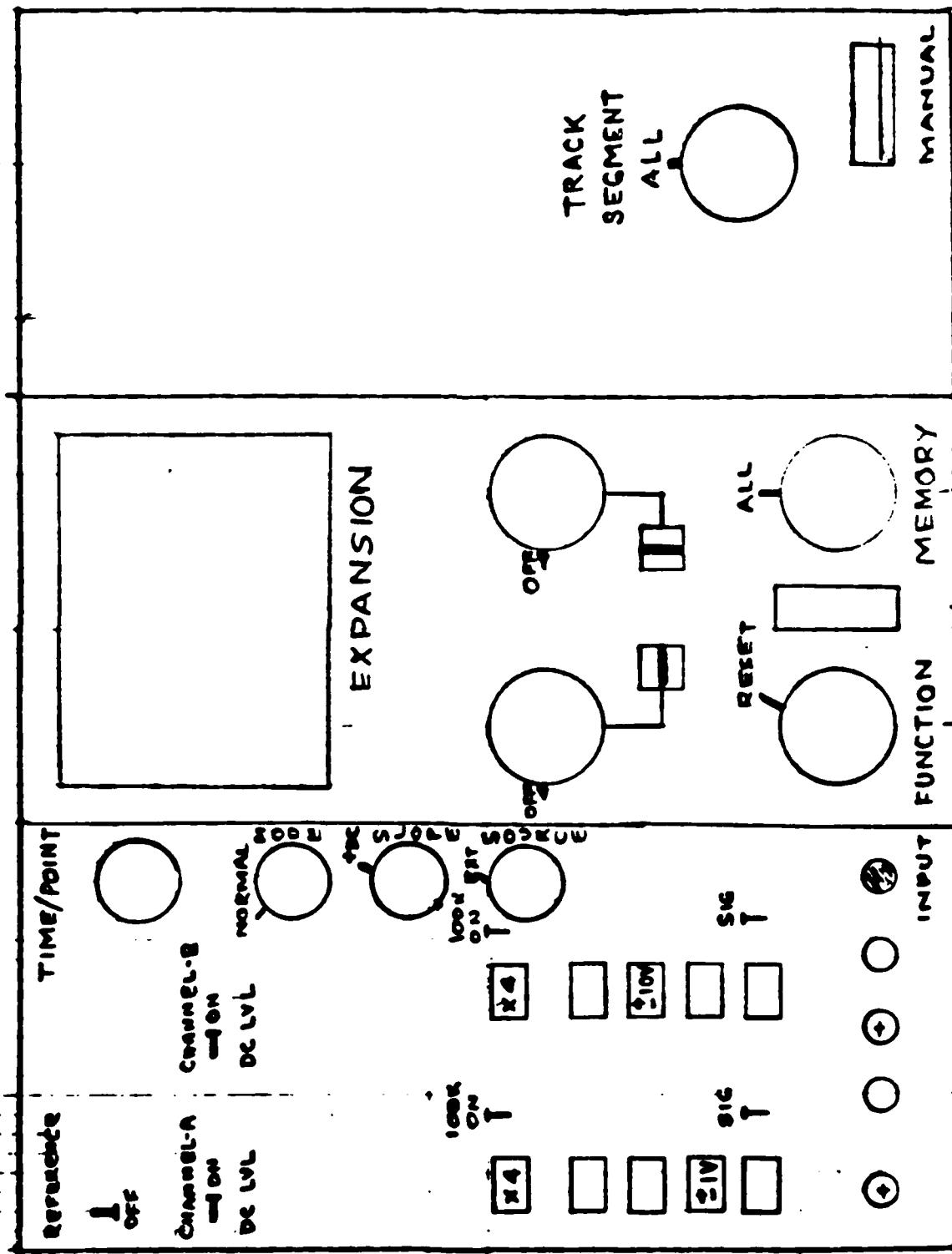
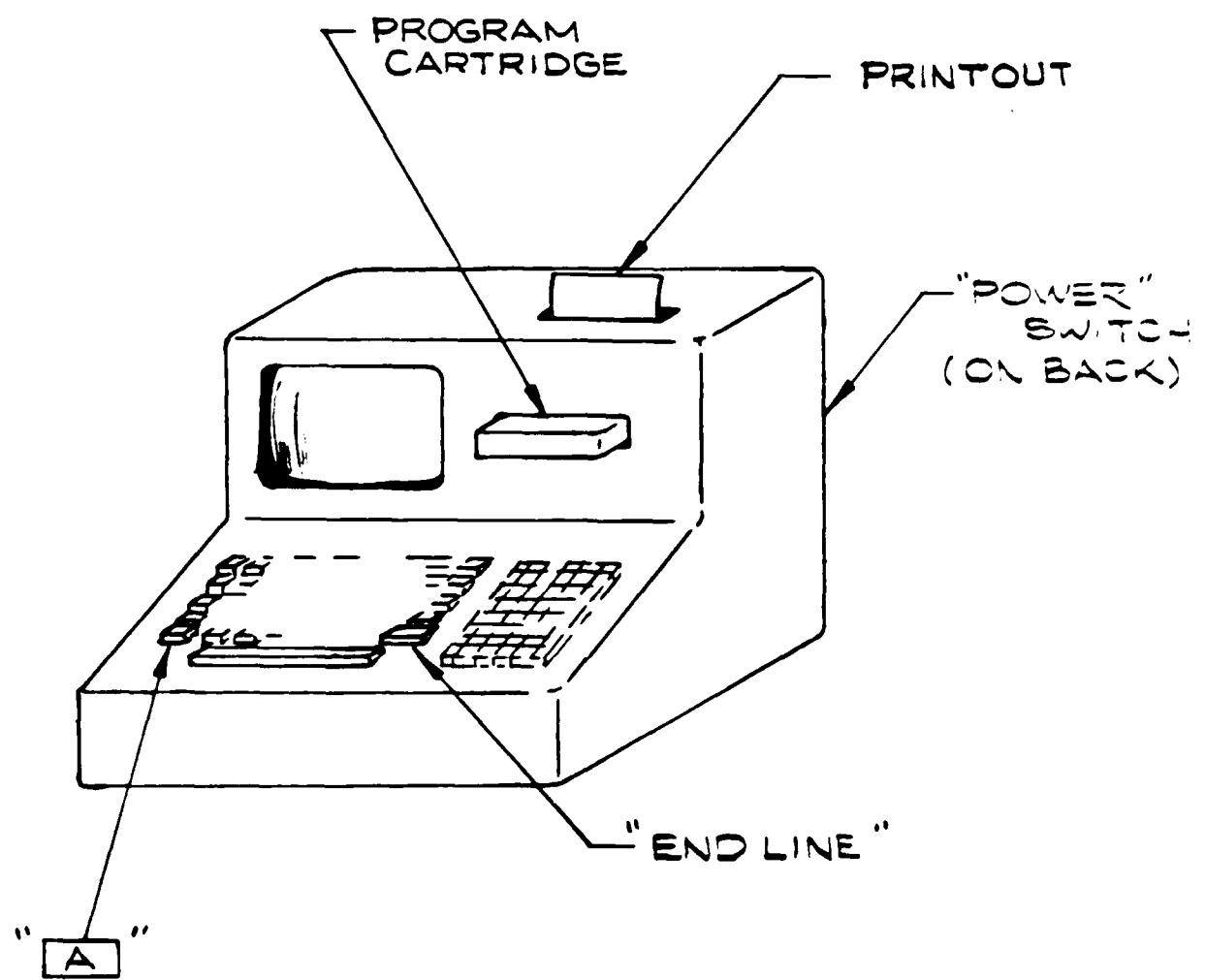


FIGURE 3

VICOLLET MODEL 206 - INITIAL SET-UP.

FIGURE-2

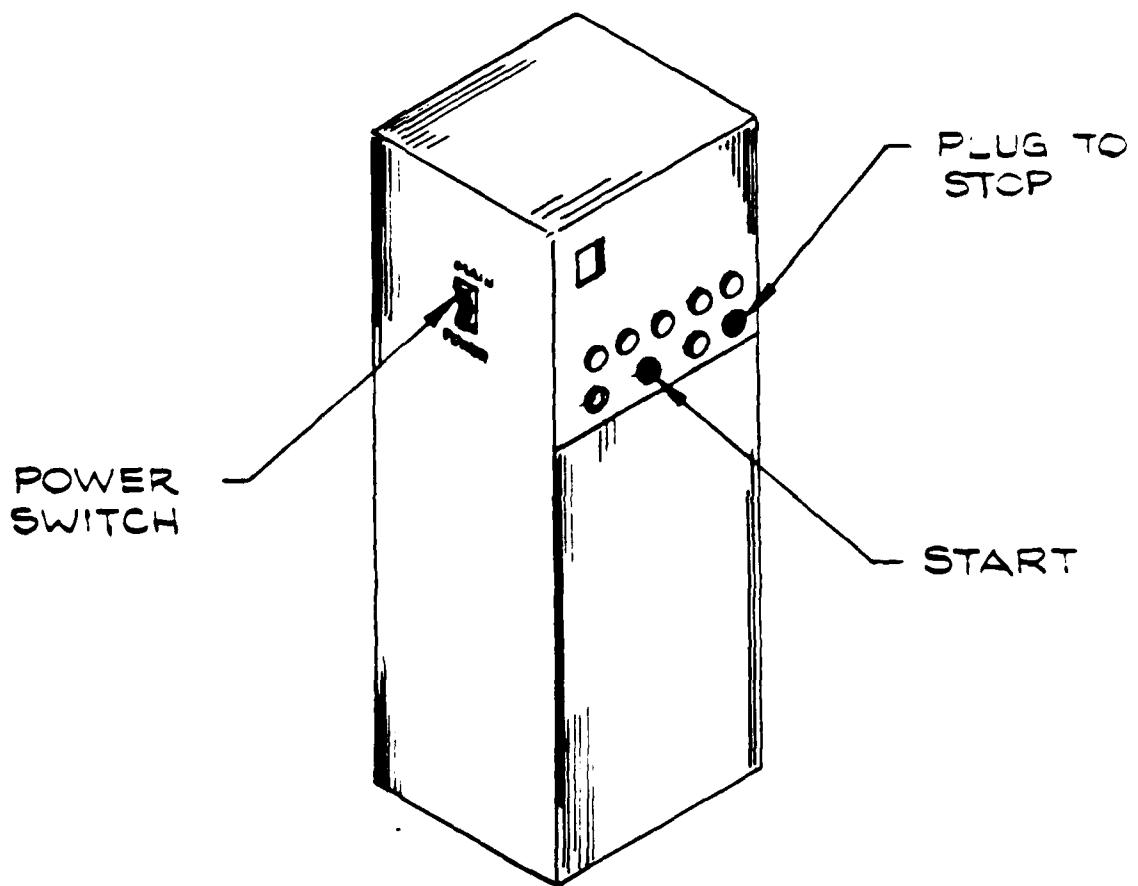




MODEL 85  
COMPUTER

FIGURE 4

121



CENTRIFUGE TIMER  
CONSOLE  
(SPEED CONTROLLER  
CENTRIFUGE)

FIGURE - 5

122

PROJECT 330

DATE 9/22/83

CENTRIFUGE ARMING TIME  
ACCEPTANCE TEST  
DATA SHEET

S/N EM 1013 thru 1016 LOT# 1

ASSY# KF 90853.2

Rev. A

REMARKS

UNIT # 1 EM 1013

ACCEPT

14.1 12.1 5.64 9.87 0  
9.74

UNIT # 2 EM 1014

ACCEPT

15.5 13.5 6.2 10.85 0  
11.37

UNIT # 3 EM 1015

ACCEPT

15.7 13.7 6.28 10.95 0  
12.21

UNIT # 4 EM 1016

ACCEPT

14.3 12.3 5.72 10.01 0  
16.93

SERIAL NUMBER  
EM 1016

INTERNAL COMPUTER DATA

INITIAL TRAVEL TIME TO REACH  
90° CONTACT (MILLISECONDS)

ARMING TIME (MILLISECONDS)

M509A2E1 Detonator Lot No. Aug 1-7

M509A2E1 Detonator Installed By;

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Ball Staked By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Arm Time Tested By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

Reset To "Safe" By:

Sig: \_\_\_\_\_ Date: \_\_\_\_\_

X-Ray To Verify Safe By: NA

Sig: \_\_\_\_\_ Date: \_\_\_\_\_



APPENDIX N  
TRAVELER  
FOR  
DEMONSTRATION TEST PLAN  
PART B



PROJECT 330 - PHASE II  
M509A2E1 BDE CONFIGURATION - DEMONSTRATION TEST PLAN TRAVELER

SHEET OF \_\_\_\_\_

STA #	ASSY	DESCRIPTION	LOT #	QTY MADE	SAMPLED	ACCEPT QTY	REJECT QTY	MFG SIG	INSP SIG	MFG/INSP DATE	REMARKS
9	KB90184	S2 CONT. ASSY.	1	2	130	130	0	0	MFG	10/5/83 2/9/84	1 Ds 1/2 S2 2 As 6/15/84
9	KB90184	INSPECTION	1	2					INSP	14/16/84	6/15/84
10	KF90839	S2 & JACK ASSY TO P.C.B.	1	260					MFG		INSP PART OF STA 15
10	KB90839	INSPECTION	1	260	260	260	0	0	INSP.		
11	KB90841	S2 SW ASSY.	1	2	3	4	120	120	MFG	10/5/83 2/9/84	1 Ds 1/2 S2 2 As 6/15/84
11	KB90841	INSPECTION	1	2	3	4	120	120	0	0	INSP.
12A	KF90839-2	LEAD FORM. AXIAL LEADS	1	500					MFG	10/5/83 2/9/84	1 Ds 1/2 S2 2 As 6/15/84
12B	0839-2	LEAD FORM. RAD.	1	160					MFG	10/5/83 2/9/84	1 Ds 1/2 S2 2 As 6/15/84
13	KF90839-2	INSTALL COMP							MFG	10/5/83 2/9/84	1 Ds 1/2 S2 2 As 6/15/84
14	KF90839-2	COMP LEAD DRESS	1	256					MFG	10/5/83 2/9/84	1 Ds 1/2 S2 2 As 6/15/84
15	KF90839-2	SOLDER & CLEANING	1	256					MFG		
15	KF90839-2	DISASSEMBLY & TOUCH UP	1	256					MFG		
15	KF90839-2	MAGNETIC POWER SUPPLY INSPECTION	1	2	3	49	54	160	- 54 144	49 0 16	INSP. Acc 6/15/84 Acc 6/25/84 Acc 6/6/84

BASIC DATA  
REVIEWED BY  
ENG QC

ARRADCOM DATE  
ARRADCOM REP DATE  
ARRADCOM DATE

DATA      REVIEWED      ENG      OC      BSIC

ARRADCOM REP.  
DATE \_\_\_\_\_  
DATE \_\_\_\_\_

DATE \_\_\_\_\_

**BULova** / SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM, NEW YORK

APPENDIX O  
SAMPLE DATA COLLECTION FORM  
PART B



**Note:** This is a sample. Inspection reports on stations 10 through 23 available on request.

- Q. PREVENTIVE MAINTENANCE
- Q. ADMINISTRATIVE (STATE REASON)  
7. ARRADCOM RESERVED
- Q. OPERATIONAL DOWNTIME (STOCK CHARGED)

1. ENJOY THE  
2. GET INVOLVED  
3. CONNECTIVE  
4. GROW AND LEARN

THE AMERICAN ECONOMIST

MAINTENANCE  
PERSONNEL

SIGNATURE

1

三



APPENDIX P  
DEMONSTRATION TEST PLAN



DEMONSTRATION TEST PLAN

CDRL ITEM A013

Manufacturing, Methods & Technology  
relating to the  
Magnetic Power Supply Assembly  
of the  
M509A2E1 Base Detonating Element

Submitted to:

U. S. Army Armament R & D Command

Dover, N.J. 07801

Attn: DRDAR-QAR-E

**BULOVA**

**SYSTEMS & INSTRUMENTS CORPORATION**

6 Sept. 1983

Project 330

135

Revision B

**BULOVA**

SYSTEMS & INSTRUMENTS CORPORATION  
VALLEY STREAM NEW YORK

TO:  Commanding Officer U. S. Army Armament R&D Command Dover, N.J. 07801  Att: DRDAR-QAR-E Mr. J. Bednarz	DOCUMENT NO. 330-017	B
	DATE 6 Sept. 1983	
	PROGRAM MM&T Relating to the MPSA of the M509A2E1 BDE	
	PRIME CONTRACT DAAK10-80-C-0183	

SUBJECT

DEMONSTRATION TEST PLAN

CDRL Item A013

PREPARED BY: \_\_\_\_\_  
M. Moskowitz

APPROVED BY: \_\_\_\_\_  
S. B. Schulman

APPROVED BY: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**BULOVA SYSTEMS & INSTRUMENTS CORPORATION**

**MANUFACTURING, METHODS & TECHNOLOGY  
FOR THE  
M509A2E1 FUZE MAGNETIC POWER SUPPLY  
CDRL ITEM A013**

**DEMONSTRATION TEST PLAN**

	<u>TABLE OF CONTENTS</u>	<u>PAGE NO.</u>
1.0	Objective of the Demonstration Test	1
2.0	Major Assemblies to be Tested	1
3.0	Identification of Equipment Required and Description of Set-up	2
4.0	Sequence of Assembly Procedures	6
5.0	Assembly Station Layouts	6
6.0	Bench Layouts	6
7.0	Floor Plan	6
8.0	Test Data Collection	9
9.0	Criteria for Acceptance	9
10.0	Demonstration Procedures	9
11.0	Demonstration Test Schedule	10
	Appendix A- Assembly Station Layouts	A1 - A33
	Appendix B- Inspection Instruction Cards	B1 - B13

REV. A

1.0 Objective of the Demonstration Test

The objective of this test is to demonstrate pilot assembly, inspection, and test equipment operation of the Magnetic Power Supply equipment. This equipment was designed to support a monthly production rate of 10,000 units on a single shift, 8 hour day, 5 days a week basis. This is to be performed in conjunction with the assembly line available for the M509A2E1 Fuze.

2.0 Major Assemblies to be Assembled and Tested

LIST OF MAJOR ASSEMBLIES			
ASSY. STATION #	ASSY. PART #	DESCRIPTION OF ASSEMBLY	REMARKS
8	KD90830	SETBACK GENERATOR ASSY.	
15	KF90839	MAGNETIC POWER SUPPLY ASSEMBLY	
21	KD90852-1	HOUSING, MOLDED ASSEMBLY	

## 3.0 IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
1	273-19006	Air Press W/Sld'g Anvil Fixt.	Install (2) Terminal in Bobbin
1	273-60009	Pin Pull Out Tester	Pull Test (2) Terminals Installed in Bobbin
2	BW-157349 273-19002 273-19003	Modified Bulova Production Type Coil Winding Machine & Wire Tensioning Devices	Wind Coil Assembly of Setback Generator Assy Control Wire Feed to Winding Machine
2	273-19008	Tray Peg Board	Storage Tray for Coil Assy
2	273-19007	Holding Fixture	Support and Rotate Coil Assy During Application of Tape
3	BW-158862	Bulova-Resistance Welding Machine	Power Pack, Remote Control and Welding Head
3	273-19010	Modified Electrodes	Special Welding Electrodes
3	273-19011	Welding Fixture Indexing -2 Positions	Fixture to Position Assy for Welding
3	273-60007	Weld Test Fixture	To Measure Weld Strength
3	273-60004	Continuity Tester	V.O.M. and Interface Fixt.
3	273-60010	Polarization Tester	Validates Direction of Coil Winding & Start Lead of Winding
4	273-19013	Air Cylr. and Press-In Fixt.	Press Fit Armature Plate into Armature Body
4	273-19014	Tray, Storage	For Armature Sub Assy
5	273-19015	Air Cylr and Press-in Fixt.	Press Fit Shearing Plt. into Generator Cover
6	273-19016	Air Cylr and Press-in Fixt.	Press Fit Cover Sub Assy into Arm. Sub Assy
6	273-19017	Air Press and Tooling	Swage Body of Armature 360° Around Cover Sub-Assy

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
7	273-60006 273-60002 273-60003 273-60008	Setback Generator Final Assy Tester	Measures Generator R, L and Insulation Resistance. Contains Tools 273-60002, 60003, 60008 and Interface Fixture.
8	273-19001	Magnetic Charger Charging Fixt. and Charging Tray	Charge Magnet of Setback Generator Assy
8	273-60001	Gaussmeter and Holding Fixture W / Probe Built In	Measures Leakage Flux of Magnetically Charged Generator Assy
9	273-19009	Crimping Tool- "Automator"	Crimp Contact Wire in Switch Terminal
9	273-19018	Tray Storage	Storage Tray
11	273-19019	Press-In Fixture W/Horizontal Slide Lever	Press-In (1) S2 Switch Contact in S2 Housing
10	273-19020	Staking Tool Automator	Stake Movable S2 Switch Contact to P. C. Board
10	273-19022	Press-In Fixture "Potence"	Press-In Connector Jack to P. C. Board
12A	273-19004	Axial Lead Component Forming System	Heller Leadmaster H-116A and Custom Dies. Forming Component Leads of R1, R2, D1 and S4
12B	273-19005	Radial Lead Component Forming System	Heller Radial Component Former RD-70C and Custom Die For Capacitor C1
13	331-19005	Assembly Holding Fixture	Holder P. C. Board Carrier during Assy
14	331-19006	Assembly Fixture P. C. Board Carrier	Fixture to Hold P. C. Board Carrier while Applying Spot Mask & Dress Leads

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
15	331-19004	P.C. Board Carrier Rack	Hold P.C. Board Carrier Before/After Wave - Soldering and Cleaning Process.
15	331-19002	P.C. Board Cleaning Machine	Hollis Ultra-Clean Cleans PC Board Carriers after Soldering
15	331-19003	Wavesoldering Machine	Hollis Wavesoldering Machine TDL 10" Wide for Soldering P.C. Board Carriers.
15	331-19007	Slide-Wavesoldering Machine	Soldered P.C. Carrier Slide From Soldering Machine Output End to Work Table
15	331-19008	Storage Container -Stiffeners	Storage container for P.C. Carrier Stiffeners
15	331-19009	P.C. Board Removal Tool	Remove Individual P.C. Boards from P.C. Board Carriers
15	331-19010	Soldering Fixture for S2 Switch	Fixture for Hand Soldering S2 Switch Assy
15	331-19011	Alignment Fixt. for S4 Impact Switch	Perpendicularity Alignment Fixt. for S4 Impact Switch
15	331-19012	Modified Cleaning Machine P.C. Board Basket	Modified Cleaning Machine Basket to Hold P.C. Board Carriers during Cleaning Operation
15	273-19021	Tray Storage	Storage Tray for Individual P.C. Board Assemblies
16	273-19027	Staking Tool "Automator"	Stake GND Wire in Rotor Housing
17	273-19028	Staking Tool Air Press	Stake P.C. Board (M.P.S.) in Housing Assy
18	273-19030	Press-In Fixture Probe Grom 141	Install (4) Grommets in Power Supply Cover
18	273-19031	Press-In Fixture Shell Receptacle	Installed Shell Receptacle in Power Supply Cover

## IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
19	273-19032	Swaging Tool P.S. Cover to Rotor Housing	Swage P.S. Cover to Rotor Housing
19	273-19034	Tray-Storage	Storage Tray
20	331-19013	Encapsulation Holding Fixt.for Rotor Housing	Holding Fixture for Rotor Housing during Encapsulation of Magnetic Power Supply
20	331-19001	Encapsulant Dispensing Device	Dispenses predetermined qty of Encapsulating Material Repeatedly
21	273-60005 002	Acceptance Test Console - Magnetic Power Supply Assy	Electrical Check Out of Magnetic Power Supply Assembly after Encapsulation Computer Evaluated W/Print Out
22	273-19035	Radial Riveting Machine	Install (2) Leaf Pins in Rear Bearing Bridge Plate Assembly
	273-19036	and Fixture	
23	331-60001	Acceptance Test Console Arming Time Test	Arming Time Test: Computer Evaluated W/Print Out - Housing and Mechanism Assy.

REV. A

#### 4.0 Sequence Of Assembly Procedures

The flow of major assemblies through the manufacturing sequence is depicted in the chart KB90840 on page 7. A total of 23 assembly stations have been planned. The assembly and inspection stations designed for this project are bench type, aided - assembly fixtures, which are consistent with the desired production rate.

#### 5.0 Assembly Station Layouts

Each of the 23 assembly stations are described in detail on the Assembly Station Layouts, pages A1 to A33. The arrangement of the work station is shown, together with a description of the operation. The applicable operation sheet is noted as well as the tooling used at the station and a listing of the input parts required to feed the station.

#### 6.0 Bench Layouts

The floor space requirements for the individual stations are shown on Page 8. A total area not to exceed 1,500 sq. ft. is indicated using 5 ft. benches.

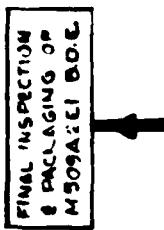
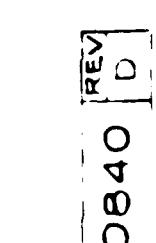
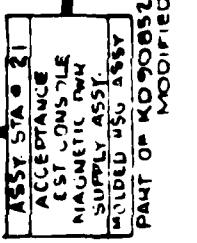
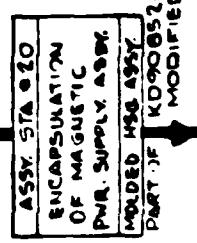
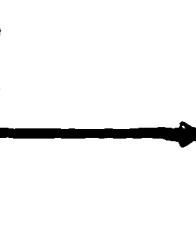
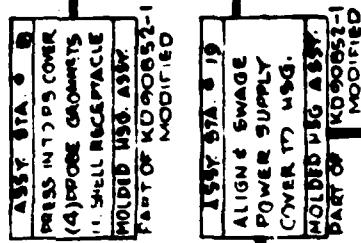
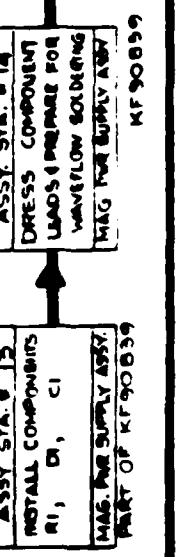
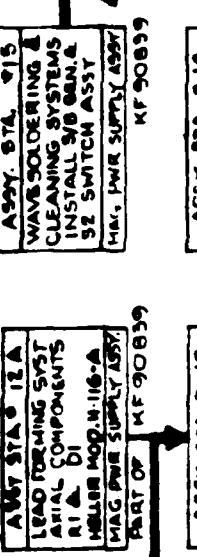
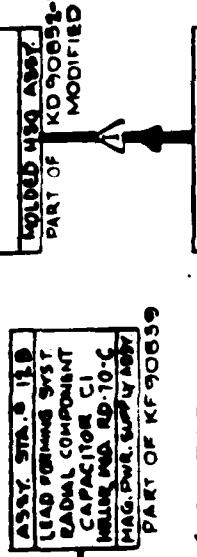
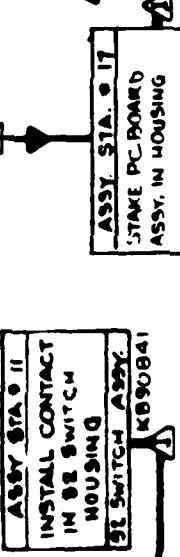
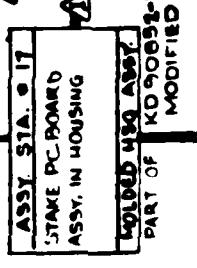
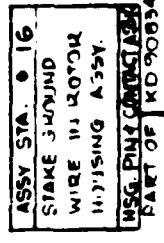
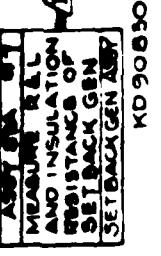
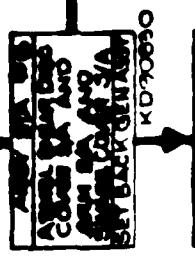
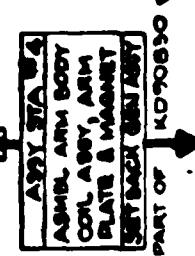
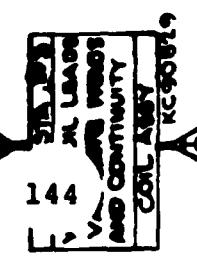
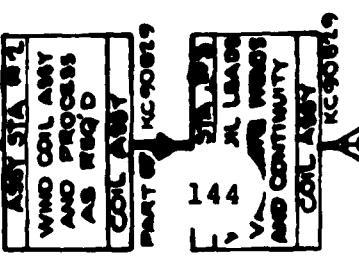
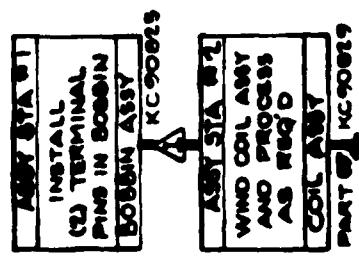
#### 7.0 Floor Plan

An arrangement of the work stations to form a potential assembly line configuration is shown on Page 8. The locations indicated may not reflect the current or final locations of the equipment. Bulova Systems & Instruments Corporation is presently rearranging the entire Valley Stream plant subsequent to the transfer of metal fabrication to the Freeport plant.

SYSTEMS & INSTRUMENTS DIVISION  
SUBJECT: MAGNET POWER SUPPLY  
FIR-A-F II  
ASSEMBLY SEQUENCE

Sheet No. 1 of 1  
Job No. 350-351  
Rev. D

REF: MISOPA01 EUE - INITIATION



**FLOW**

KB 90840 REV D

# FLOOR PLAN - DEMONSTRATION TEST

46' 6"

VENTING, ROO

OUTSIDE



SCALE

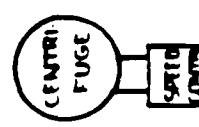


0 1 2 3 4 5 FEET  
1/2' = 1'

145' 1000 SQ. FT.

STA-1	STA-2	STA-3	STA-4	STA-5
STAGING	STA-6	STA-7	STA-8	STA-9

STA-10	STA-11	STA-9	STA-12A	STA-12B	STA-13
STA-10	STA-10	STA-17	STA-16	STA-15E	STA-14



STA-19	STA-20	STAGING	STA-22	STAGING
--------	--------	---------	--------	---------



32'

REV. A

#### 8.0 Test Data Collection

Data will be collected using the form and instructions furnished by the U. S. Government as shown on pages 12 and 13 , and other Bulova forms where appropriate. The Industrial Engineer shall be responsible for the entries on the data sheet and the calculation of the actual operating rate. The Quality Control Department will assure adherence to specification requirements by inspecting material in accordance with the Inspection Instruction Cards.

#### 9.0 Criteria for Acceptance

The Assembly Flow Chart, KR90840, page 7 identifies those assembly stations whose output is subject to inspection. Where required, inspection will be conducted in accordance with the Inspection Instruction Card. Acceptance criteria shall be in accordance with the applicable drawing and Inspection Instruction Card. A further evaluation will be made by a Quality Control Engineer, together with the Project Engineer, to determine the repairable/scrap status of any non-conforming units. In no event shall the scrap rate exceed 10%.

#### 10.0 Test Procedures

The general procedures for all assembly or inspection stations are given below.

1. The station operator will be from the Bulova hourly workforce assigned to that area, where feasible.
2. The operator shall have had a minimum of 8 hours instruction and/or operating time for the station under test, where feasible.
3. The material required for the test will be at the station prior to the start of the test. All the relevant piece part inspection sheets and identifiers will be recorded on the data sheet.

REV. A

4. The test will be under the control of the Assembly Group Leader, the only person who will issue instructions to the operator and inform the test data recorder of specific reasons for stopping (if not obvious). The test data will be recorded by the Industrial Engineer/Inspector.
5. Prior to the start of any test, a minimum of three assemblies/test units will be run through the station and inspected to verify that the station is operating properly, where applicable.
6. The participants from ARRADCOM shall receive a 3 working day minimum notice prior to the start of any test.
7. Testing of assembly/inspection stations will be handled as expeditiously as possible. First piece inspection will be followed by batch inspection conducted concurrently as far as is feasible.
8. A fifteen minute break will be scheduled approximately half way through each 4 hour demonstration. It will not be part of the 4 hour run time. If any unexpected work stoppages occur, the run time will be extended, where feasible, to fulfill the 4 hour run time.

#### 11.0 Demonstration Test Schedule

Demonstration testing will occur in two phases. Phase A will encompass Assembly Stations Nos. 1 through 8 which will utilize 11 bench set-ups. The target starting date for this phase is 20 June 1983 with completion estimated to be 30 June 1983.

Phase B will cover Assembly Stations 9 through 23 which will utilize 20 bench set-ups. The target starting date for this phase is 1 September 1983 with completion estimated to be 21 September 1983.

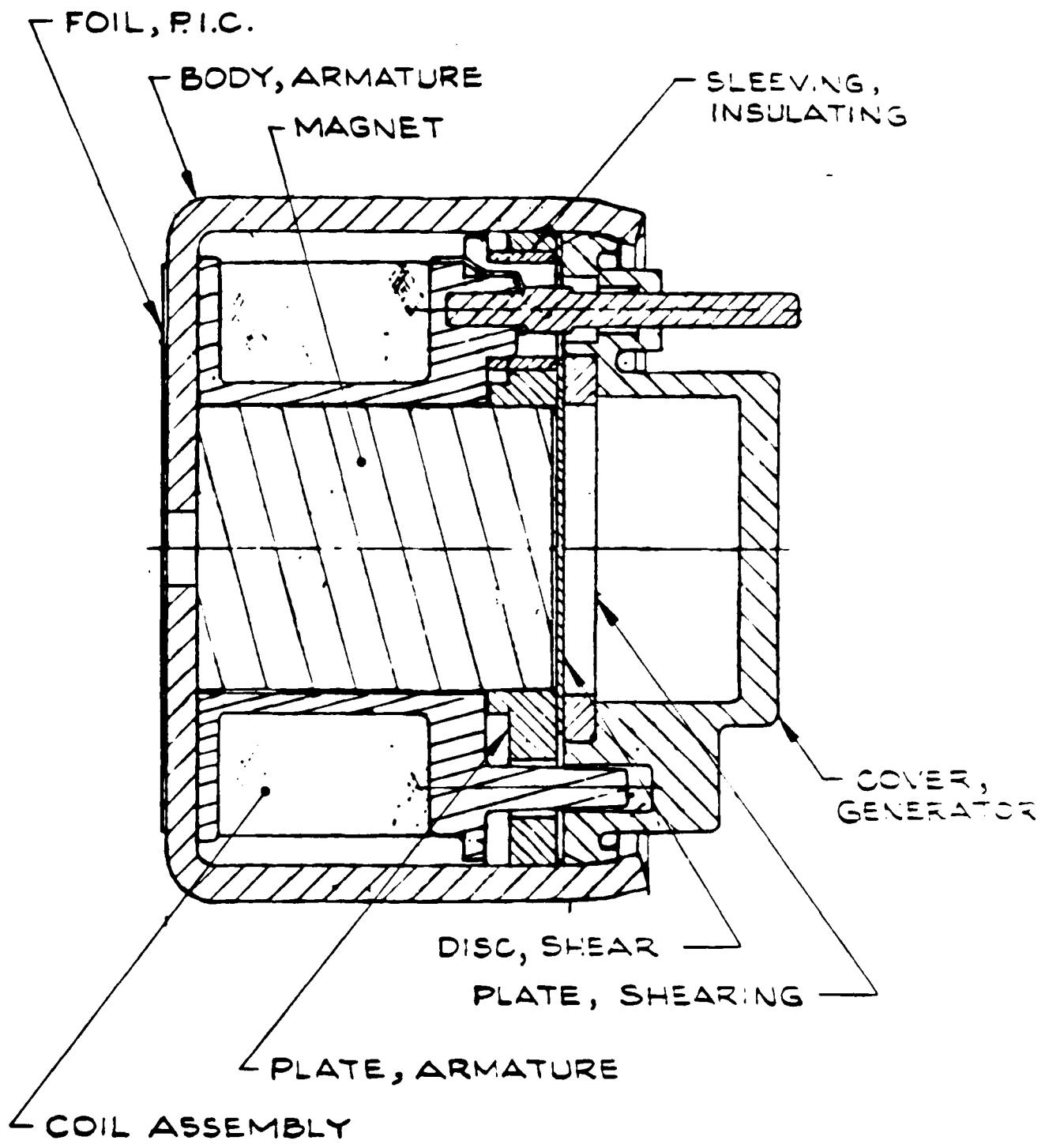
A final report on the cond' of the Demonstration Test will be furnished by 30 Se<sup>147</sup> 1983.

INSTRUCTIONS FOR COMPLETING DATA COLLECTION FORM

BLK      INSTRUCTIONS

- 1 Enter name of production facility.
- 2 Print or type data collector's name in box in lower right corner of sheet, leaving space for signature.
- 3 Enter function or operation that the station performs. Only one station per data sheet.
- 4 Enter page number and total number of pages for the station in the format "Page No. \_\_\_\_ of \_\_\_\_".
- 5 Enter assigned station number.
- 6 Enter the station under observation. Starts up the "Start of Shift" time, to the nearest minute, using Military (2400 hr) time, will be recorded. If more than one station is watched, take care and record each station's start time on the appropriate data sheet.  
(Blocks 7 through 12 are to be completed for each station stoppage following indicated start times)
- 7 Enter start date on each data record line used. Start a new sheet each day. A 6-digit format should be used; e.g., 3 February 1980 would be recorded 38 020380.
- 8 Enter the event stop time to the nearest minute, using Military time. (A timing device, such as a stopwatch, should be started immediately to measure precisely the duration of the stoppage).
- 9 Enter the appropriate 1-digit event code selected from the list of codes provided at the bottom of the form.
- 10 After the station is restored to an operating condition, enter the duration of downtime time in minutes and seconds.
- 11 Enter remarks which clearly describe reason for station stoppage unless an equipment failure mode (see Blk 13) is applicable, in which case this block need not be completed. It is immaterial that stoppages for the same reason result in this block being completed in a consecutive manner. The entry in this block is limited to 47 alphanumeric characters including blanks.
- 12 If number of maintenance personnel required to restore station to operation exceeds one (1), enter number utilized.
- 13 If the stoppage is the result of an equipment failure requiring corrective maintenance (Event Code 3) and a previously defined 3-digit failure code describes the mode of failure, the failure code is entered.
- 14 At least four times a shift the actual production rate should be measured while the machine is experiencing uninterrupted operation. The rate should be measured over a period of several (3-10) minutes and averaged to get the "per minute" rate. All rate measurements will be averaged to compute an average rate for the shift. The averaged rate is recorded in this block.
- 15 Enter the End of Shift time to the nearest minute in Military Time. If the End of Test (Event Code 4) occurs during the day data is being gathered, it is that time which is recorded in this block. Under any circumstances the time recorded in this block is the time at which the station was shut down for the day, unless required corrective maintenance on the station caused the shut down. In the latter case the time of day maintenance personnel came off-duty is recorded.
- 16 Enter the total number of units processed during the shift whether it be in pounds or parts.
- 17 Indicate whether the entry in Blk 16 is in pounds or parts. If another term is applicable, i.e., box, enter the term in OTHER.
- 18 Enter the number of acceptable (conforming or nondefective) units, parts, pounds, or pounds processed during the shift.
- 19 Enter the sum of the number of rejects which occurred during the shift. This includes repairable and non-repairable (scrap) rejects.
- 20 Sign completed data forms at the end of the shift and note in an individual responsible for gathering the data.





SETBACK GENERATOR  
ASSF<sub>150</sub> BLY

DEMONSTRATION PROCEDURE

ASSEMBLY STATION NO.1

1.0 ASSEMBLY DESCRIPTION

Operator obtains (2) Post, Terminal from part bin with tweezers and places in position in nest of Tool No. 273-19006. Operator places Bobbin in required position in nest. Operator actuates tool to press Posts into Bobbin. Operator removes Bobbin assembly from tool and places in trav.

2.0 INSPECTION DESCRIPTION

Inspector checks first three (3) pieces from operator in accordance with Inspection Instruction Card. The inspector will use Tool No. 273-60009 to pull test 2 pins inserted in flange of Bobbin. If satisfactory, each completed lot will be inspected in accordance with the AQL of the Inspection Instruction Card. All results shall be recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 120/HOUR

4.0 RUN PLAN

Run to complete four lots of approximately 120 pieces per lot. This should take approximately four hours.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 2

1.0 ASSEMBLY DESCRIPTION

Operator installs 4 Bobbin assemblies into each of the two turrets of the coil winding machine, Tool No. 273-19002. Operator wraps wire around posts and starts coil winding on completion of coil winding at this station. The wire tension is controlled by tension device, Tool No. 273-19003. Operator advances turrets to next location and repeats operation. Operator removes completed coil assemblies, cutting leads approx. 2" from bobbin and reloads stations with new bobbin assemblies.

2nd Operator takes coil assemblies and places them into a holding fixture, Tool No. 273-19007, to rotate coil assemblies while applying tape to outside diameter of coil. On completion, this operator will chemically strip insulation from lead wires from coil. Operator places completed assemblies in tray, Tool No. 273-19008.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a 4 hour period to manufacture approximately 260 assemblies.

DEMONSTRATION PROCEDURE

ASSEMBLY STATION NO. 3

1.0 ASSEMBLY DESCRIPTION

Operator obtains Coil Assembly and winds the start and finish leads around designated areas on their respective terminal posts. The Coil Assembly is positioned on the indexing fixture - 2 position, Tool No. 273-19011, of the Bulova-resistance welding machine, Tool No. BW-158862. The special welding electrodes, Tool No. 273-19010 is engaged and positioned. Operator welds one terminal post; then the other. The Coil Assembly is removed from the welding machine and returned to same storage tray, Tool No. 273-19008, in which it arrived.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with the Inspection Instruction Card. Inspector checks the validity of the welds using the weld test fixture, Tool No. 273-60007, continuity of the Coil Assembly using continuity tester, Tool No. 273-60004, and direction of winding and start lead of winding using polarization tester, Tool No. 273-60010. If satisfactory, operator continues. At conclusion of lot run, assemblies are inspected in accordance with AQL of the Inspection Instruction Card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run to complete 2 lots of approximately 130 pieces per lot. It is anticipated that this will take approximately 4 hours.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 4

1.0 ASSEMBLY DESCRIPTION

Operator places Armature Plate over the three protruding pins of the Bobbin Assembly and lowers this assembly into the lower nest of Tool No. 273-19013.

The operator then places the Armature Body over the assembly and rotates the Body until it is located in proper position to clear the three recessed tabs.

Operator actuates tool to press plate into position in Armature Body. Operator removes assembly from nest and then installs two insulating sleeves into position over pins.

Operator then installs magnet into the central cavity of the assembly; then places assembly into storage tray, Tool No. 273-19014.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 5

1.0 ASSEMBLY DESCRIPTION

Operator places the Generator Cover into the nest of the fixture, Tool No. 273-19015, then obtains (1) Shearing Plate from part container with tweezers and places in position on Cover.

Operator actuates tool to press Shearing Plate into position. Operator removes assembly from nest and places into tray.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 6

1.0 ASSEMBLY DESCRIPTION

Operator places assembly of Armature Body into nest of fixture.

Operator assembles the Shear Disc onto the protruding locating pin and the (2) Terminal pins, and lowers into position.

Operator places the Cover Subassembly into the Armature, using Tool No. 273-19016 to press into position.

Operator actuates swaging fixture, Tool No. 273-19017, to swage edge of Armature over cover. Operator removes completed assemblies and places them into tray.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 7

1.0 INSPECTION DESCRIPTION

Inspector obtains a completed Setback Generator from storage tray supplied by Station No. 6 and inspects it in the fixture of the final assembly tester of the Setback Generator tester, Tool No. 273-60006. The inspector activates the tester to measure resistance, inductance, and insulation resistance (Hi-Pot) - terminal post to armature case. If satisfactory results are obtained for the first (3) units, testing will continue in accordance with the AQL of the Inspection Instruction Card with results recorded on data sheet. Accepted assemblies will be placed in storage tray for transport to next assembly station.

2.0 ANTICIPATED INSPECTION RATE - 65/HOUR

3.0 RUN PLAN

Inspect continuously for a four-hour period yielding approximately 260 assemblies.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 8

1.0 ASSEMBLY DESCRIPTION

Operator obtains setback generators from storage tray supplied by Station 7 and loads up to (30) of them in charging tray, Tool No. 273-19001. The operator places the loaded charging tray in the charging fixture of the magnetic charger, Tool No. 273-19001, and activates the unit. The charging tray is then unloaded and the charged generators placed in a storage tray for transport to inspection.

2.0 INSPECTION DESCRIPTION

Inspection checks first (3) generator assemblies for specified flux leakage using gaussmeter and holding fixture, Tool No. 273-60001. If satisfactory, operator continues. At conclusion of run, assemblies are inspected in accordance with AQL of Inspection Instruction Card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run to complete 2 lots of approximately 130 each. It is anticipated that this will take approximately 4 hours.

NOTE: The generators would normally be completed by installing a foil disc over the central hole. This operation will be conducted after the successful completion of the Pneumatic leakage test; not part of the M.M. & T. Program.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 9

1.0 ASSEMBLY DESCRIPTION

Operator places Switch Terminal into nest of fixture, Tool No. 273-19009. With tweezers, operator inserts Wire, Terminal, into Switch Terminal and activates Tool. With tweezers, operator removes assembly and places into tray, Tool No. 273-19018.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card. All results are recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run to complete 2 lots of approximately 130 assemblies per lot. It is anticipated that this will take approximately 4 hours.

Rev. B

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 10

1.0 ASSEMBLY DESCRIPTION

Operator installs S2 Contact Assembly into its mounting hole and solders into position. Operator then places S2 Switch Housing Assy. into position and heat stakes its (3) legs to P.C. Board.

Operator locates Jack connector into its mounting holes and presses into position using Tool No. 273-19022. Completed assemblies to be placed in P.C. Board carrier storage rack, Tool No. 331-19004.

2.0 INSPECTION DESCRIPTION

Inspection checks first (3) pieces from the operator in accordance with the Inspection Instruction Card. If satisfactory, each completed lot will be inspected in accordance with the AQL of the Inspection Instruction Card and the results recorded on the data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously to manufacture approximately 2 lots of approximately 130 per lot. It is anticipated that this will take approximately 4 hours.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 11

1.0 ASSEMBLY DESCRIPTION

Operator places S2 Switch Housing in nest in Tool No. 273-19019. Operator places (1) Wire Contact into location in Tool.

Operator activates tool and inserts Contact into Housing.

Operator places completed assembly into tray.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from the operator in accordance with the Inspection Instruction Card. If satisfactory, each completed lot will be inspected in accordance with the AQL of the Inspection Instruction Card and the results recorded on the data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 120/HOUR

4.0 RUN PLAN

Run continuously to manufacture approximately 4 lots of approximately 120 per lot. It is anticipated that this will take approximately 4 hours.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 12A  
(SEE NOTE AT BOTTOM)

1.0 ASSEMBLY DESCRIPTION

Operator locates Resistors R1 or R2 and fills a supply rack on Machine No. 273-19004.

Operator activates machine to bend the leads of the Resistor and crop the legs to a predetermined length.

Operator places completed Resistors into a plastic stack bin.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 480/HOUR

4.0 RUN PLAN

Run continuously for a one-hour period to manufacture 480 parts.

NOTE: Resistor R1 or R2 will be demonstrated; the machine can be reset to handle the Diode D1 and the Impact Switch S4.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 12B

1.0 ASSEMBLY DESCRIPTION

Operator locates Capacitors into nest in Machine No. 273-19005.

Operator actuates machine to cut Capacitor leads at approximately .10 from body of Capacitor. Operator places completed Capacitors into a plastic stack bin.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 480/HOUR

4.0 RUN PLAN

Run continuously for a one-hour period to manufacture 480 parts.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 13

**1.0 ASSEMBLY DESCRIPTION**

The operator will install the P. C. Board Carrier assembly into the Assembly Holding Fixture, Tool No. 331-19005.

The operator will then install the following components into the marked locations on the P.C. Board. All the components will be handled using finger cots, tweezers, or needle-nosed pliers.

Components to be installed are:

- 1 Resistor R1
- 1 Diode D1
- 1 Capacitor C1
- 4 Jack, Pin

The P.C. Board Carrier Assemblies will stay in the Holding Fixture and proceed to next assembly station.

**2.0 INSPECTION DESCRIPTION**

No inspection is required at this operation.

**3.0 ANTICIPATED ASSEMBLY RATE - 8 P.C.Bd. CARRIER ASSEMBLIES/HOUR**

**4.0 RUN PLAN**

Assembly will continue for a four-hour period to complete approximately 32 P.C. Board Carrier Assemblies.

Demonstration Procedure  
Assembly Station No. 14

1.0 ASSEMBLY DESCRIPTION

The operator will remove the P.C. Board Carrier Assembly from the Assembly Holding Fixture, Tool No. 331-19005, and mount them in the Fixture, Tool No. 331-19006.

Operator will mask P.C. Boards in accordance with the model supplied by Engineering. Any final positioning of electrical components will be carried out and lead legs will be dressed if necessary.

The completed Boards will now be transferred from the Fixture, Tool No. 331-19006 into the P.C. Board Carrier Rack, Tool No. 331-19004. Transport filled rack to next station No. 15A.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 8 P.C. BOARD CARRIER ASSEMBLIES/HOUR

4.0 RUN PLAN

The operation will be continued for 4 hours or until all available components have been utilized to assemble 32 P.C. Board Carrier Assemblies.

NOTE: Assembly stations 13 and 14 may be combined and run at a single work station by one operator if circumstances at rehearsals/demonstration suggest this would better serve the purpose.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 15

1.0 ASSEMBLY DESCRIPTION

The operator removes a P.C. Board Carrier Assembly from the storage rack, Tool No. 331-19004, and obtains (2) stiffeners from container, Tool No. 331-19008; then installs one stiffener each on front and rear of carrier assembly. Operator feeds carrier assembly into finger conveyor system of wavesoldering machine, Tool No. 331-19003. P.C. Board Carrier Assembly exits from the end of the conveyor onto a slide and comes to rest on the workbench. The operator removes the stiffeners from the carrier assembly and accumulates them for return to the input workbench for reuse.

The soldered carrier assemblies are placed in the cleaning machine's modified basket, Tool No. 331-19012, until the basket is filled. Additional carrier assemblies awaiting the cleaning process are temporarily stored in an additional storage rack, Tool No. 331-19004. The filled cleaning machine basket is lowered into the cleaning machine, Tool No. 331-19002, and cleaned.

After cleaning, the operator removes the filled cleaning basket from the machine. Operator then removes the P.C. Board Carrier Assemblies and places them in an additional storage rack, Tool No. 331-19004. The empty basket is returned to the input workbench of the cleaning station for reuse.

The operator removes the cleaned P.C. Board Carrier Assemblies, and using the P.C. Board removal tool, Tool No. 331-19009, removes each of the individual P.C. Board Assemblies from each carrier. Confor 166 Coat Diode D1 and Capacitor C1 in

accordance with assembly drawing KF90839.

The operator examines component lead dress and installs Setback Generator Assembly KD90830. The operator places the P.C. Board Assembly in storage tray, Tool No. 273-19021, for transport to the Inspection Station.

**2.0 INSPECTION DESCRIPTION**

Inspection will check the first P.C. Board Carrier Assembly for workmanship and soldering process in accordance with the Inspection Instruction Card. If satisfactory, return the Carrier Assembly to the operator for separation of the (8) individual P.C. Board Assemblies from their carrier and for completion of remaining assembly tasks. The inspector will then complete the remaining inspection requirement on the (8) P.C. Board Assemblies in accordance with AQL of the Inspection Instruction Card. Results shall be recorded on data sheet.

**3.0 ANTICIPATED ASSEMBLY RATE - 8 CARRIER ASSEMBLIES/HOUR**

**4.0 RUN PLAN**

The operation will continue for 4 hours, or until 32 Carrier Assemblies have been completed and inspected, and/or all available materials utilized.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 16  
SEE NOTE BELOW

1.0 ASSEMBLY DESCRIPTION

Operator places Rotor Housing in nest of Tool No. 273-19027. Operator next secures ground wire, KB90228 from part pin and locates same in position on Rotor Housing, KF90824. Operator actuates tool to stake wire to Rotor Housing. Operator removes sub-assembly from tool. The operator will then cut the ground wire to the specified length and place the assembly in tray for transport to next station.

2.0 INSPECTION DESCRIPTION

Inspector checks first three (3) pieces from operator in accordance with the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card and results recorded on data sheet. (The inspector will be inspecting item 10 of the Inspection Instruction Card only.)

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

- A. Run one lot of 55 Rotor Housing Assemblies (Ref.: P/N KF90824). Identify individually.
- B. Run two lots of approximately 100 each Rotor Housing Assembly (Ref.: P/N KF90222 - obsolete type).

NOTE: The Rotor Housing will have previously been assembled with the following parts:

90° Contact Assembly	#KD90219
Pin Housing	#KB90119
Sleeving Insulation 168	#MIL-I-22129

and the 90° Contact Assembly will have been prepotted in position.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 17

1.0 ASSEMBLY DESCRIPTION

Operator obtains Power Supply Assembly from storage tray (Ref: Assembly Station No. 15E). Operator obtains quantity of prepared encapsulation material from Assembly Station No. 20 on an as-required basis. Operator applies a bead of this encapsulation material to the flange of the S2 Switch Housing to provide sealing at the Rotor Housing interface.

Operator then aligns the 2 pin jacks with the ground wire and 90° contact in the Pin and Contact, Housing Assembly, KD90834-1. Operator inserts Power Supply Assembly in the Housing Assembly, mating the two connectors. Operator places assembly in Tool No. 273-19028 and stakes P.C. Board into the Housing Assembly in four places. Units are then set aside to allow the encapsulation sealant to set.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with items 1 & 10 of the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run one lot of 55 Housing Assemblies and then two lots of approximately 100 each Housing Assemblies. This should take approximately four hours.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 18

1.0 ASSEMBLY DESCRIPTION

Operator obtains (1) Insulator KC90822 and aligns with mating hole pattern in (1) Power Supply Cover KC90812. Operator secures (4) Probe Grommets, KB90819, from part bin with tweezers, aligns and places same into associated holes in Power Supply Cover KC90812. Operator places Power Supply Cover in Tool No. 273-19030 and activates tool to stake 4 grommets in place. Operator removes Power Supply Cover from tool and secures one Receptacle Shell, KC90342 from part bin. Operator locates same in position on Power Supply Cover and places in Tool No. 273-19031. Operator actuates tool to stake shell into cover at 4 places. Operator removes Cover Subassembly and places in tray.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with the Inspection Instruction Card, Item 1 only. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with AQL of the Inspection Instruction card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture 3 lots of approximately 85 assemblies per lot.

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 19

1.0 ASSEMBLY DESCRIPTION

Operator secures Housing Subassembly from Assembly Station 17 and Power Supply Cover Subassembly from Assembly Station 18. Operator aligns and locates Cover Subassembly on Housing Subassembly and places same in Tool No. 273-19032. Operator actuates tool to swage Cover Subassembly to Housing Subassembly. Operator removes assembly from tool and places in storage tray, Tool No. 273-19034.

2.0 INSPECTION DESCRIPTION

No inspection at this station

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 20  
SEE NOTE BELOW

**1.0 ASSEMBLY DESCRIPTION**

Operator obtains semi-completed Molded Housing Assemblies from storage trays supplied by Assembly Station No. 19 on an as-required basis. Operator performs pre-encapsulation preparations on Rotor Housing and installs same in holding fixture, Tool No. 331-19013. The operator obtains the encapsulating material, resin and hardener, and proceeds to proportion, mix, de-air, and fill encapsulating material dispensing device, Tool No. 331-19001, in accordance with encapsulating process. The operator completes encapsulation of the Molded Housing Assembly and allows to cure. The operator removes assembly from holding fixture and all assembly/process aides. The completed Molded Housing Assemblies are placed in storage tray. The assemblies will then be machined to add slot cut per drawing, but not as part of this demonstration.

**2.0 INSPECTION DESCRIPTION**

Inspector checks first (3) assemblies from the operator in accordance with the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card and results are recorded on data sheet.

**3.0 ANTICIPATED ASSEMBLY RATE - 25/HOUR**

**4.0 RUN PLAN**

Run to complete one lot of 55 assemblies and two lots of approximately 50 ea. assemblies. This should take approximately four hours.

**NOTE:** Pre-encapsulation preparation requires two operators for approximately four hours.

Rev. A

DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 21

1.0 INSPECTION PROCEDURE

Inspector obtains Molded Housing Assemblies as required from storage tray supplied by Station No. 20. Inspector loads (2) assemblies into dual nest fixture of Magnetic Power Supply Assembly acceptance test console, Tool No. 273-60005-002, and activates device. After assembly in nest one is tested, the inspector switches to assembly in nest two and replaces assembly in nest one with new unit to be tested. Accepted units are placed in storage tray for transport to next assembly station. Unsatisfactory units are identified and put aside. If the first (3) assemblies tested are satisfactory, the inspector continues testing in accordance with the AQL of the Inspection Instruction Card and records results on a data sheet. Test console printout shall be secured to data sheet for the first 55 units.

2.0 ANTICIPATED INSPECTION RATE - 35/HOUR

3.0 RUN PLAN

Run continuously for a four-hour period to inspect approximately 140 assemblies. If necessary, certain units can be reinspected to achieve a total run quantity of approximately 140 assemblies.

Rev. B

**DEMONSTRATION PROCEDURE  
ASSEMBLY STATION NO. 22**

**SEE NOTE BELOW**

**1.0 ASSEMBLY DESCRIPTION**

Operator secures (2) Leaf Pins, KB90823 from part bin with tweezers and places in two holes in nest, 273-19036, of Tool No. 273-19035. Operator next aligns Rear Bearing Plate, KC90673 on nest and actuates to rivet the (2) Leaf Pins into this Rear Bearing Plate. Operator removes Bearing Plate from nest and places in tray.

**2.0 INSPECTION DESCRIPTION**

No inspection at this station.

**3.0 ANTICIPATED ASSEMBLY RATE - 120/HOUR**

**4.0 RUN PLAN**

Run continuously for a four-hour period to manufacture approximately 480 assemblies.

**NOTE:** If Leaf Pin, KB90823, is not available, Leaf Pin, KB90063, will be substituted. Rear Bearing Plate Assembly containing Leaf Pins, KB90063, will be clearly identified as demonstration material/sub assembly only. THEY CANNOT BE ASSIGNED FOR USE IN DELIVERABLE HARDWARE.

Demonstration Procedure  
Assembly Station No. 23

1.0 INSPECTION PROCEDURE

Inspector obtains Housing and Mechanism Assemblies from storage tray supplied by preceding assembly station on an as-required basis. Inspector installs up to (4) assemblies - one each per nest in the centrifuge, and activates equipment to proceed with test. If the first (3) assemblies test satisfactorily, they are placed in storage tray for accepted assemblies. Inspector will continue testing 100% of all assemblies submitted in accordance with Inspection Instruction Card and record results on data sheet. Any assembly which tests unsatisfactorily shall be identified and set aside with its data sheet for review. Test console printout shall be secured to data sheet for the first 55 units.

2.0 ANTICIPATED INSPECTION RATE - 65/HOUR

3.0 RUN PLAN

Run continuously for a four-hour period to test approximately 260 assemblies. In order to test 260 assemblies, certain assemblies may be recycled as required.



APPENDIX Q  
SAMPLE ASSEMBLY STATION LAYOUT



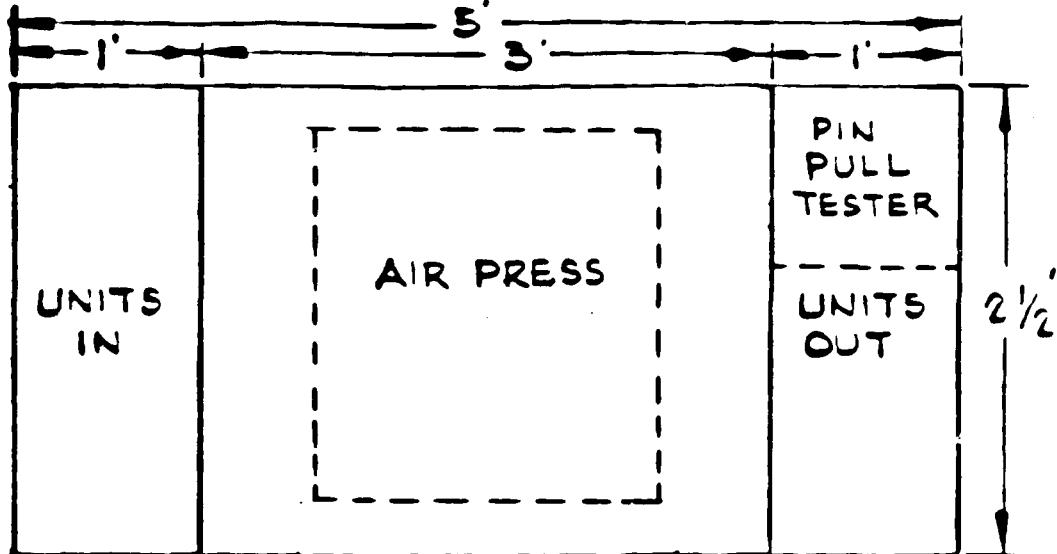
**BULOVA**

SYSTEMS & EQUIPMENT CORPORATION  
VALLEY STREAM NEW YORK

BY \_\_\_\_\_ DATE \_\_\_\_\_  
APPRVD \_\_\_\_\_ DATE \_\_\_\_\_

PROJ 330/331  
REV A

ASSEMBLY STATION LAYOUT



CHAIR  
FOR  
ASSEMBLER

BOBBIN ASSEMBLY

ASSY NO. KD90825

ASSEMBLY STATION NO.1

PROCEDURE: INSTALL TWO TERMINAL  
POSTS INTO BOBBIN

PARTS LIST (QTY PER ASSY)

- (1) KD90204 BOBBIN
- (2) KB90817 POST, TERMINAL

SPECIAL TOOLS/EQUIPMENT

- TOOL NO. 273-19006
- TOOLING TO INSTALL (2) TERMINAL POSTS  
IN BOBBIN ASSY.
- TOOL NO. 273-60009
- PULL TEST OF (2) PINS PRESSED INTO  
179 'GE OF BOBBIN.

Note: This is a sample. Stations 2 through 22 are available on request.



APPENDIX R  
SAMPLE INSPECTION INSTRUCTION CARD



B-U-L-O-V-A SHEET 1 OF 1

**USE IN ACCORDANCE WITH  
MIL-STD-105 LEVEL II  
UNLESS OTHERWISE SPECIFIED**

**INSPECTION INSTRUCTION CARD  
AND  
QUALITY RECORD**

REV. / DATE  
**A**

Project MM & T (105mm) Prod 330

PART NAME BOBBIN ASSEMBLY

PART NO. KC 90825 REV. A

## REFERENCE

CARD NO. OR

Note: This is a sample. Additional inspection instruction cards available on request.

**SEE: QUALITY STANDARDS FOR INSTRUCTIONS**

Prepared by:

APPROVED: \_\_\_\_\_ DATE: \_\_\_\_\_  
QUALITY DEPARTMENT

183

Gov't./Customer Date

~~EXCECUTIVE~~



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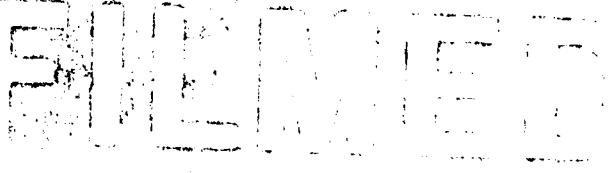
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